TECHNOLOGY DEPT

POWER

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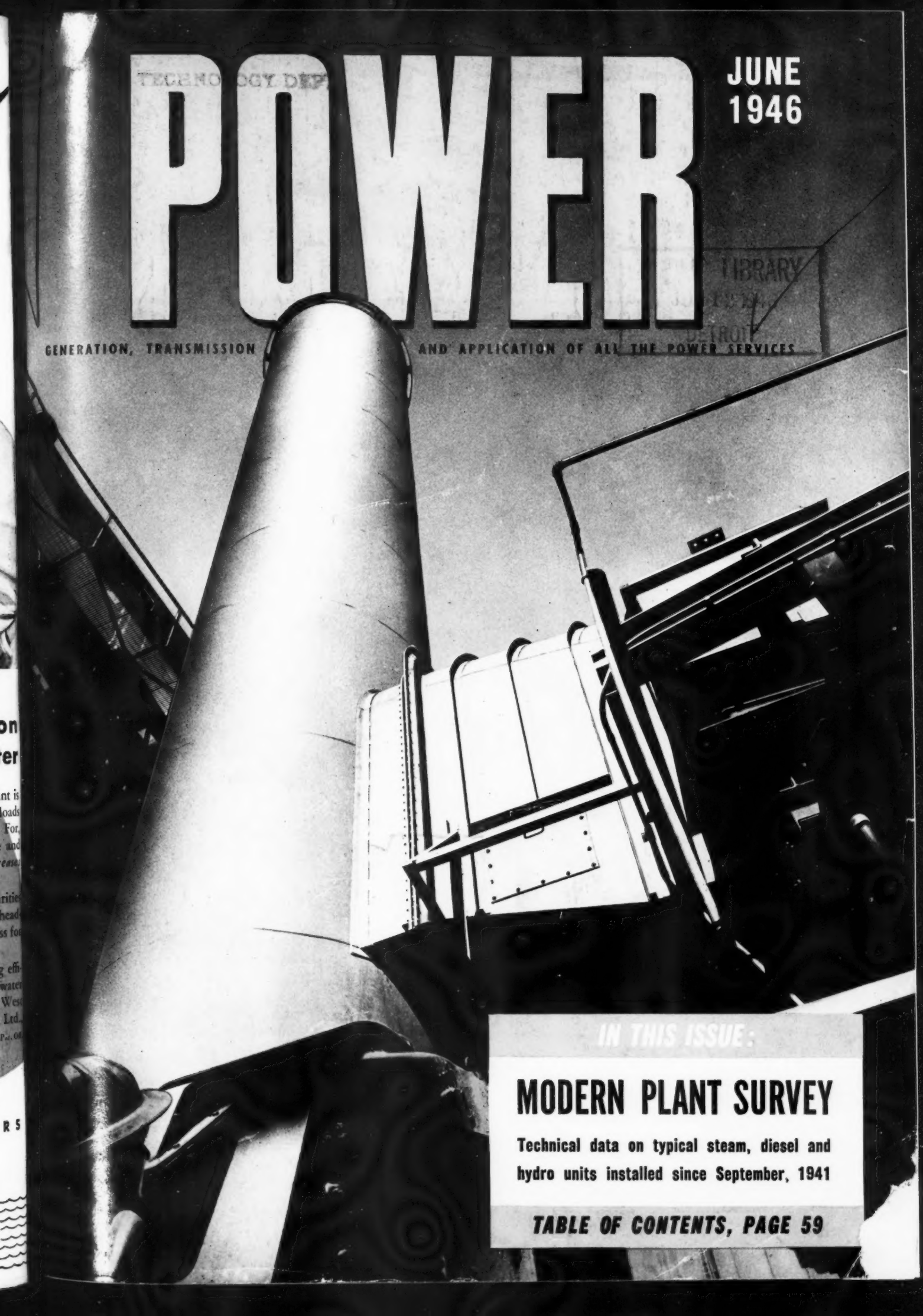
GENERATION, TRANSMISSION AND APPLICATION OF ALL THE POWER SERVICES



IN THIS ISSUE:

MODERN PLANT SURVEY

Technical data on typical steam, diesel and hydro units installed since September, 1941

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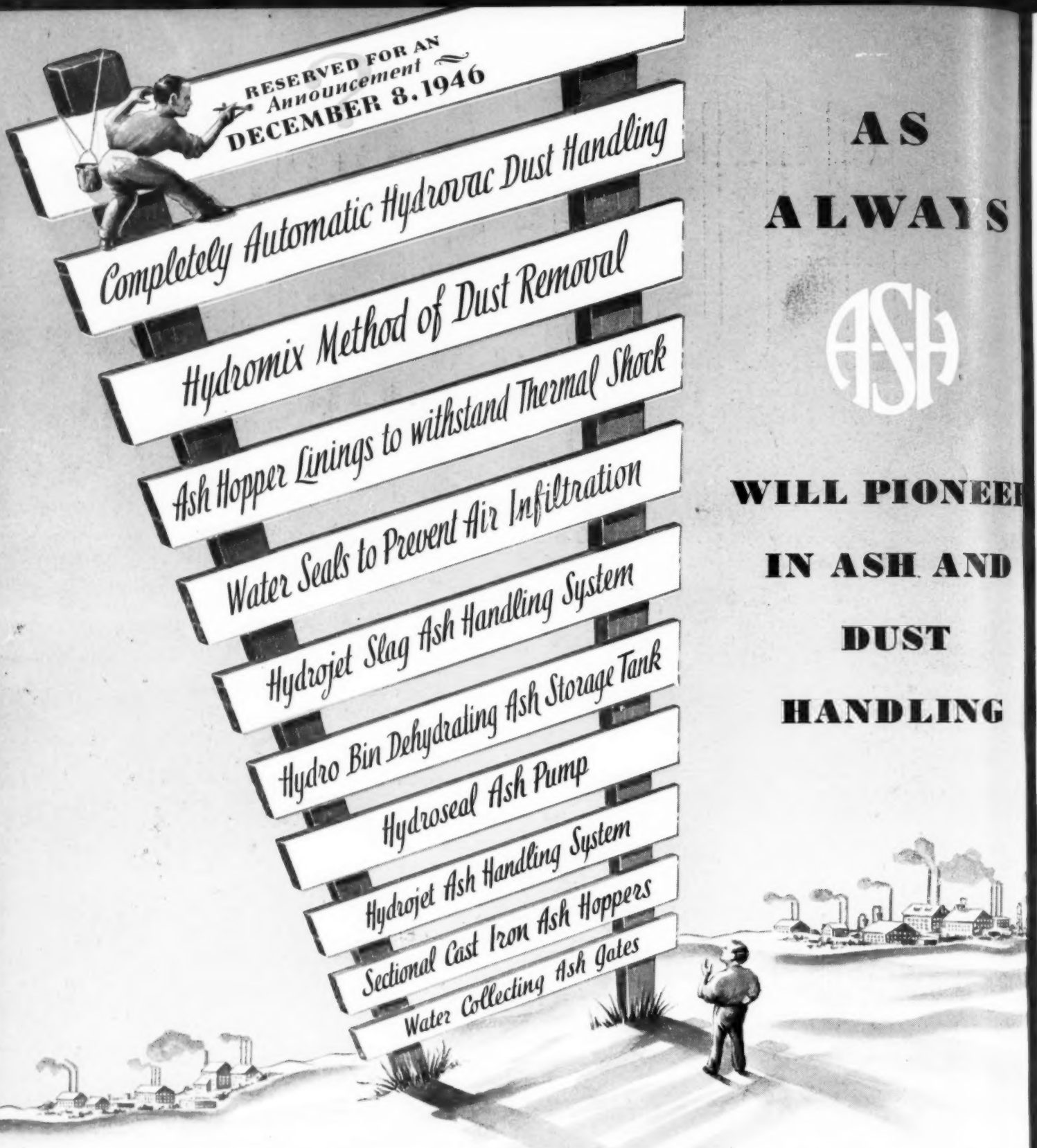

Practically ever major improvement in ash and dust handling during the past quarter century has been pioneered and developed by The Allen-Sherman-Hoff Co. No, we don't take full credit, for without the assistance and cooperation of the country's leading consulting and power plant engineers, we could not have achieved these successes. But of this one thing you may be sure "as always, A-S-H will pioneer in ash and dust handling." If you don't have all the facts regarding Automatic, Remote Control Hydrovac Dust Handling you are missing something.

ALLEN-SHERMAN-HOFF CO., 227 S. 15th St., PHILADELPHIA 2, PA. *Offices & Representatives in Principal Cities*

POWER (with which are consolidated "Science and Industry," "The Engineer Review," "The Engineer," "The Stationary Engineer"). June, 1946, Vol. 90, No. 6. Published monthly with an additional Directory in December. McGraw-Hill Publishing Company, Inc. Publication office, 99-129 N. Broadway, Albany 1, N. Y. Editorial and executive offices, 330 W. 42nd St., New York 18, N. Y. Entered as second class matter August 25, 1936, at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, Power, 330 W. 42nd St., New York 18, N. Y. Subscription rates U. S. and U. S. Possessions, $3 for one year, $4 for two years, 50c per single copy. Canada, $5 for one year, $8 for two years. Pan American countries, $10 for one year, $16 for two years. All other countries $15 for one year, $25 for two years.

TECHNOLOGY DEPT.

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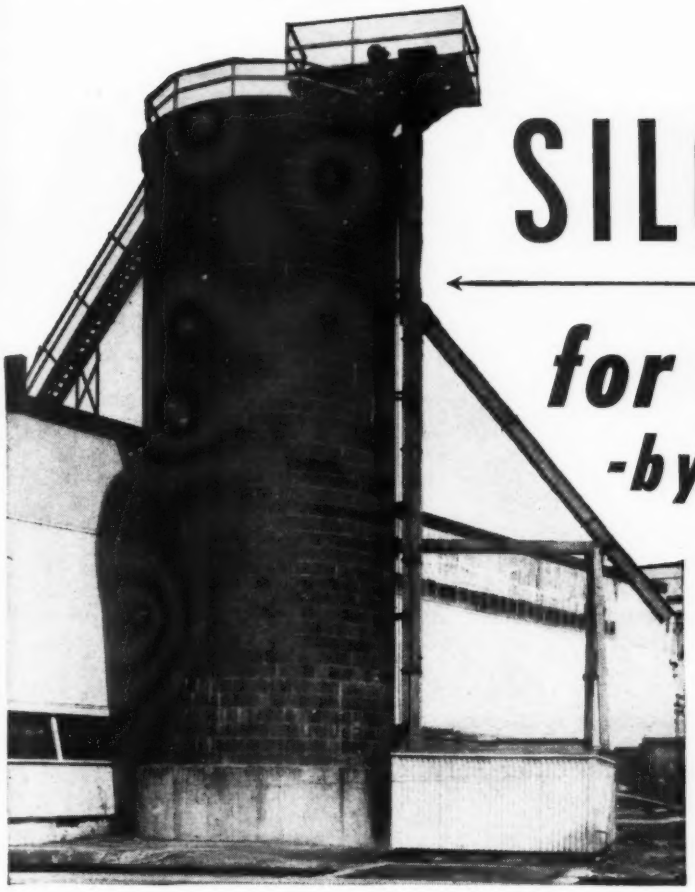
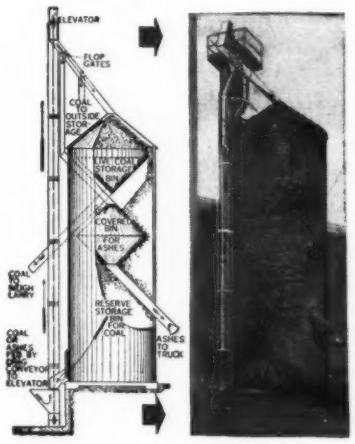
SILO SYSTEMS

for Coal Handling -by LINK-BELT

—featuring complete handling equipment



Above—Link-Belt silo coal storage system at New England Shipbuilding Corp. The chute at the right of silo is for overflow to ground storage.



FOR BOTH COAL AND ASHES

This illustration shows a Link-Belt silo system with bucket elevator for handling both coal and ashes. Coal may be diverted to ground storage through auxiliary spout. Ashes are discharged to the ash section of the silo by means of a control gate and independent spout.

The silo system of handling coal or ashes, or both, many times is the low-cost answer to the problem.

One such example is a Link-Belt silo system at West Area yard of New England Shipbuilding Corporation, South Portland, Maine, featuring conveyor equipment to handle bituminous stoker coal from hopper bottom cars to silo at the rate of 50 tons per hour; and from the silo bottom, over automatic weighing scales, to stoker hoppers in the boiler room at 10 tons per hour. The conveyor equipment consists of Link-Belt BULK-FLO Elevator-Conveyor units, both for filling the hollow tile silo and reclaiming coal from it, and auxiliary feeders, etc.

Since Link-Belt builds a wide variety of handling equipment, we can make a layout to solve any outside-storage problem, with the economic advantages of standardized units. We'll be glad to consult with you on your problem.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

10,285

LINK BELT

THE SYMBOL OF QUALITY — LB — LINK-BELT

COAL AND ASHES HANDLING EQUIPMENT

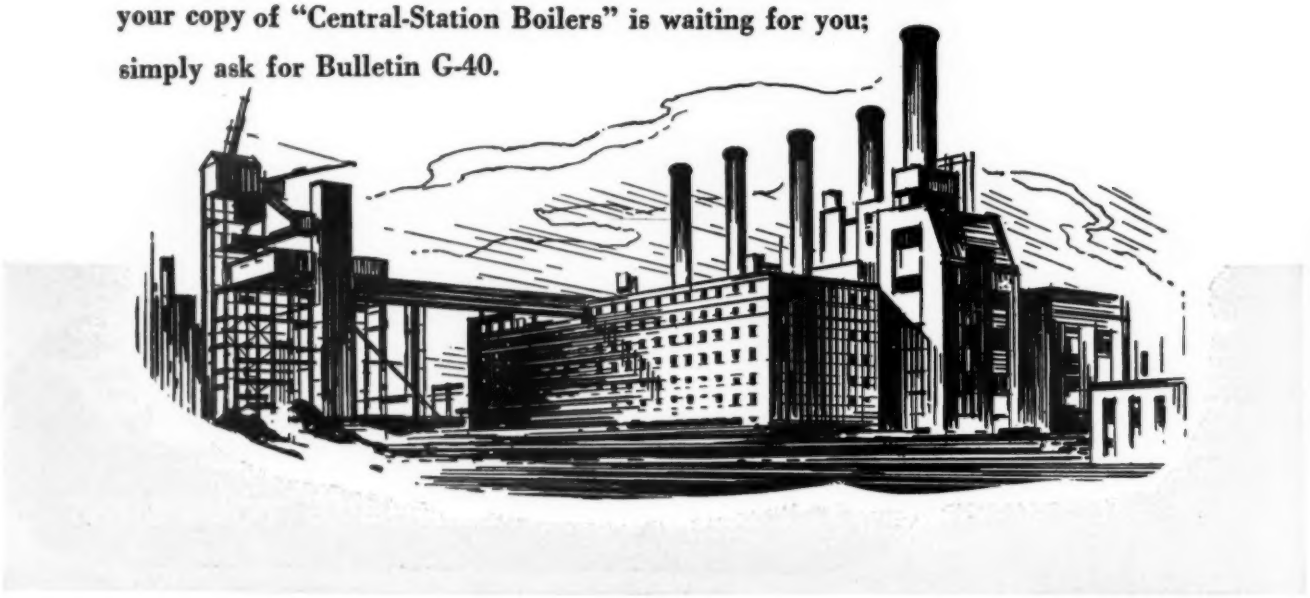
165 Central ...highlighted in

HERE'S interesting and helpful data on the latest B&W central-station boiler installations throughout the nation.

Current boiler designs are presented in detailed drawings, with capacities, pressures, temperatures, firing methods, and other pertinent information conveniently tabulated.

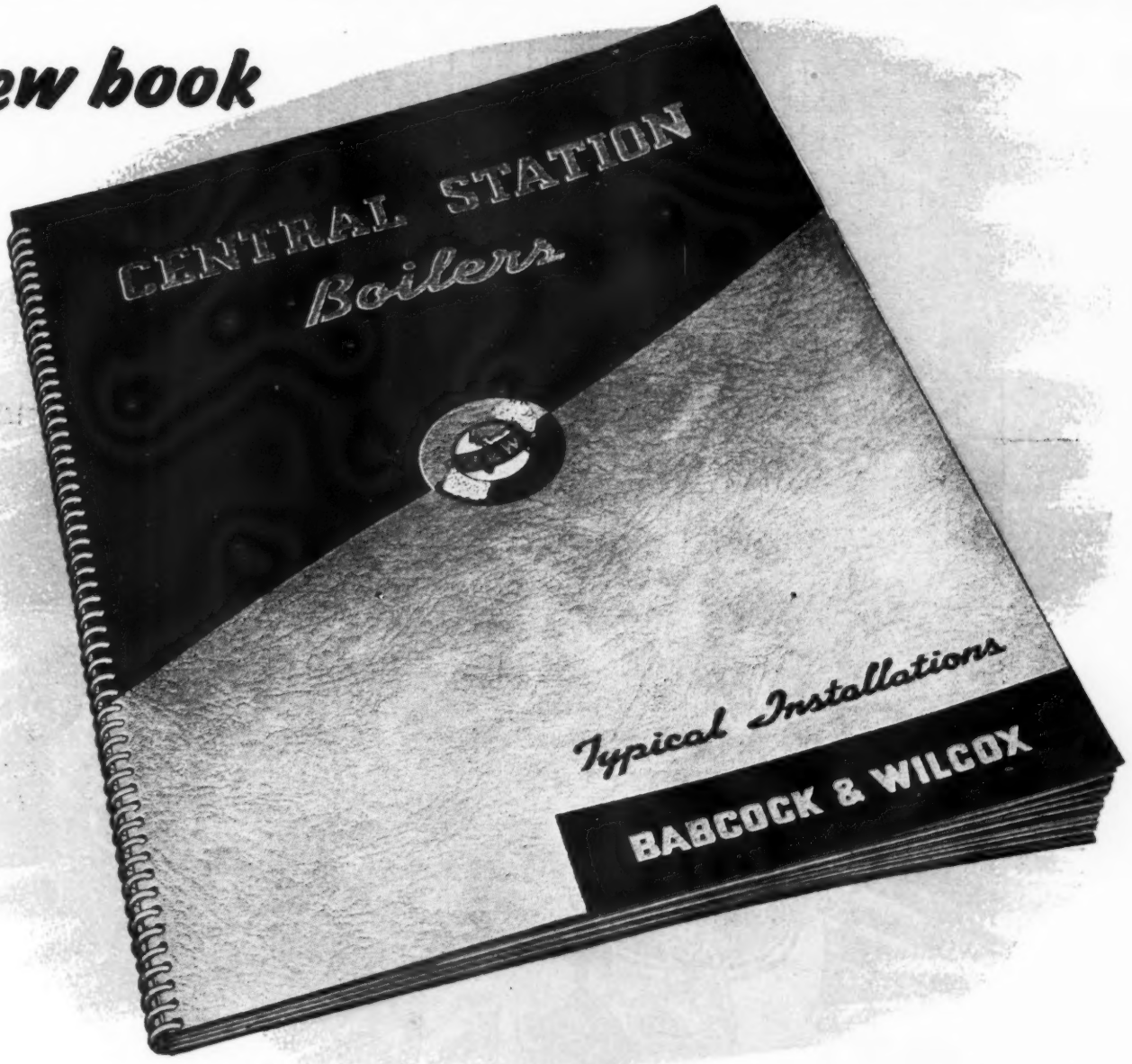
Twenty years of boiler and furnace development is traced from the early use of partial water-cooling of refractory furnaces to the B&W performance standards of today. It includes applications to boilers used for the comparatively short transition period when topping became economically desirable and boilers were designed to fit in available space in existing buildings. Examples show how standardization has been accomplished in the smaller boiler unit designs, and indicate a trend to standardization in units of the larger capacities.

B&W is ready at any time to apply the diversified experience typified in this booklet to the solution of your specific steam power problems. In the meantime, your copy of "Central-Station Boilers" is waiting for you; simply ask for Bulletin G-40.



Station Boiler Installations

new book



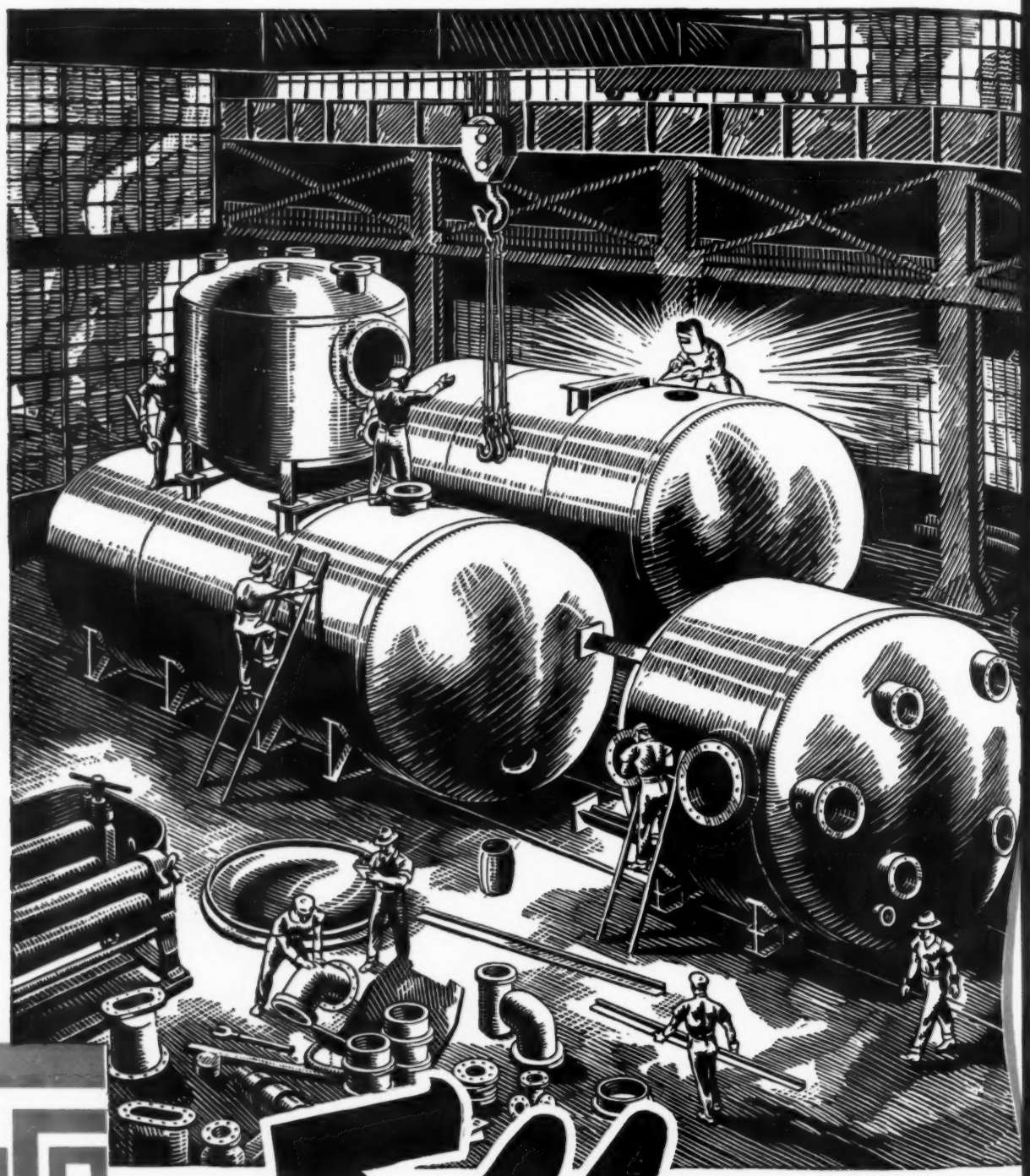
Water-Tube Boilers, for Stationary Power Plants, for Marine Service . . . Water-Cooled Furnaces . . . Superheaters . . . Economizers . . . Air Heaters . . . Pulverized-Coal Equipment . . . Chain-Grate Stokers . . . Oil, Gas and Multifuel Burners . . . Seamless and Welded Tubes and Pipe . . . Refractories . . . Process Equipment.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
85 LIBERTY STREET, NEW YORK 6, N.Y.

G-324 T

The big



Elliott

ones are back

All during the war the huge Elliott steel fabricating bay was cluttered with rank on rank of "deaerating feed tanks" as the Navy calls them. These are the seagoing version of Elliott deaerating feedwater heaters, comparatively small and compactly designed to fit on shipboard, made of rust resisting Monel, and arranged to operate unaffected by pitching and rolling. Representative units were in every major action in the seven seas, during the past four years.

But now the big ones are back again—the large units with their accompanying storage tanks, such as you will see in the important utility and industrial plants. Now service-worn units can be replaced, new capacity can be provided. For in the war against corrosion which never stops, these Elliott deaerating feedwater heaters are potent weapons, delivering zero-oxygen feedwater at saturated steam temperatures. In power plants they are corrosion's most powerful enemy.

Elliott pioneered deaeration—and is still doing it. Look for the latest deaeration developments in Elliott units. Bring your problems to "deaeration headquarters."

A RESTATEMENT OF THE SCIENCE OF DEAERATION in a 20-page booklet covering the theory and practice of this modern corrosion-fighting method. Many illustrations and informative charts. At your request—ask for Bulletin N-15.

ELLIOTT COMPANY

***Deaerator and Heater Department,* JEANNETTE, PA.**

Plants at: JEANNETTE, PA. • RIDGWAY, PA. • SPRINGFIELD, O. • NEWARK, N. J.

DISTRICT OFFICES IN PRINCIPAL CITIES

STEAM TURBINES • GAS TURBINES • GENERATORS • MOTORS • CONDENSERS
FEEDWATER HEATERS AND DEAERATORS • STEAM JET EJECTORS
CENTRIFUGAL BLOWERS • TURBOCHARGERS FOR DIESEL ENGINES
TUBE CLEANERS • STRAINERS • DESUPERHEATERS • FILTERS

N-988

DEAERATING HEATERS

1765 Boilers are now equipped with DIAMOND "AIR PUFF" Soot Blowers

In the 15 years since Diamond Automatic Sequential "Air Puff" Soot Blowers were first installed, 1765 boilers have been equipped with them. Year after year the successful operation of the rapidly increasing number of these blowers is convincing testimony to the soundness of the Diamond "Air Puff" blowing principle.

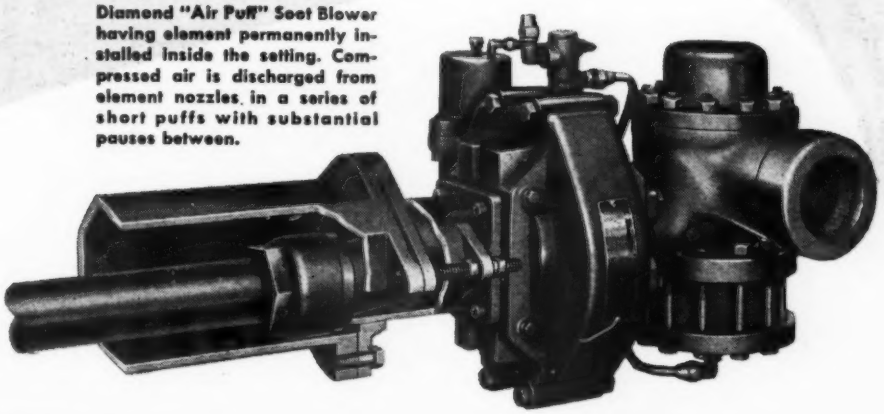
Practically every type, size and pressure are included in the 1765 boilers—heating—marine—power—up to public utility giants of 900,000 pounds per hour capacity. "Air Puff" Soot Blowers are used alone and in combination with the other types of Diamond Soot Blowers.

Compressed air has a greater density than steam and therefore provides better cleaning. The air is discharged in a series of short puffs with substantial pauses between. Spreading the cleaning cycle over a longer period of time permits use of a much smaller compressor and receiver. The many other advantages of Diamond "Air Puff" Soot Blowers are briefly mentioned on the right-hand page. Write for further information.

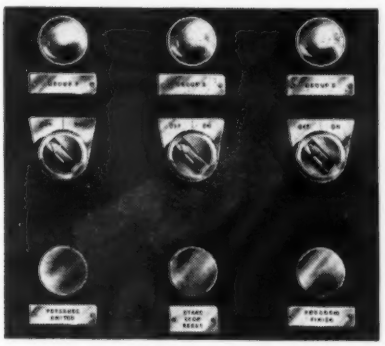
DIAMOND POWER SPECIALTY

DIAMOND SPECIALTY LIMITED,

Diamond "Air Puff" Soot Blower having element permanently installed inside the setting. Compressed air is discharged from element nozzles in a series of short puffs with substantial pauses between.



Master Controller which automatically controls the sequence and blowing time of Diamond "Air Puff" Soot Blowers only. Just a twist of the wrist to open a valve . . . the controller does the rest.



Program panel for controlling Diamond "Air Puff" Soot Blowers in combination with other blowers. All are operated in correct sequence and at right blowing speed by simply pushing one "start" button.

AUTOMATIC SEQUENTIAL OPERATION

ASSURES CORRECT CLEANING

"Human element" is entirely eliminated and each blower unit must operate in correct sequence and at right speed every time. No unit can be overlooked by careless operator.

SAVES LABOR

No attendant needed to drain piping, warm it up, and then operate each individual blower unit.

SAVES FUEL

Uses only ⅓ to ⅔ of energy from coal pile needed for steam blowing.

OTHER "AIR PUFF" ADVANTAGES

NO FEED WATER MAKEUP

Using compressed air instead of steam as cleaning medium, there is no condensate loss due to soot blowing.

STACK DISCHARGE NUISANCE MINIMIZED

Intermittent operation expels soot from boiler in small quantities.

REDUCED MAINTENANCE

Many years' experience proves maintenance costs are unusually low.

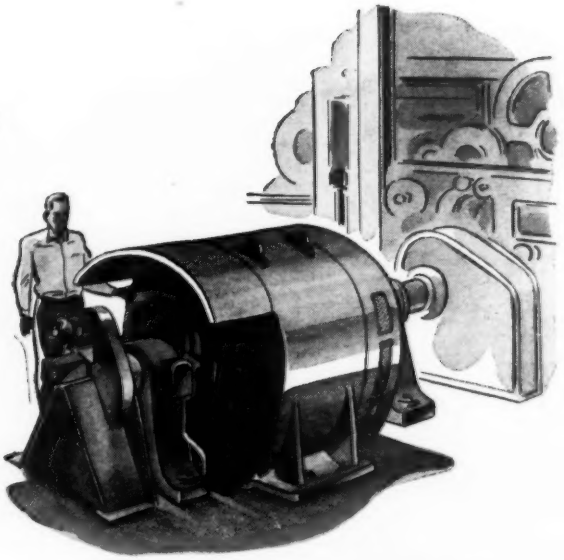
PIPING INSULATION ELIMINATED

When air is used for cleaning, soot blower piping is not insulated.

CORPORATION DETROIT 31, MICHIGAN

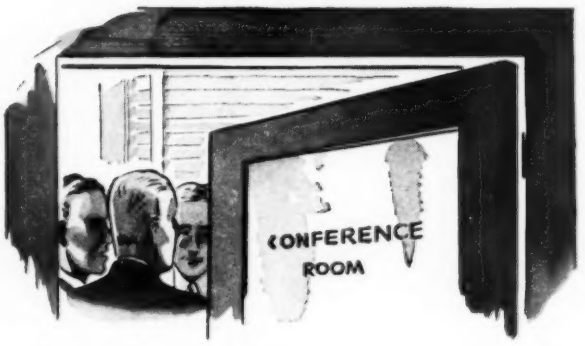
WINDSOR, ONTARIO

"What! Stop a 30" Calender Roll in Less than 14" of Roll Travel!"



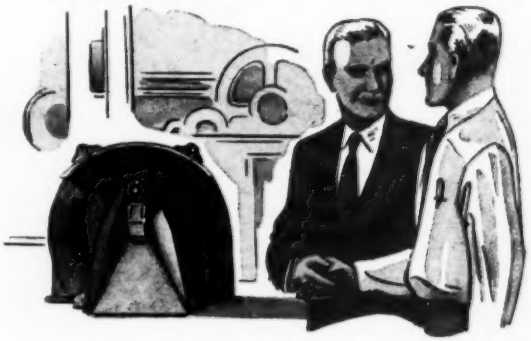
"Right! And besides that emergency stop, give us 10 to 1 speed range on the motor and hold speed *close*. The torque characteristic of our calender requires that the motor have high overload capacity at low speeds without overheating. And because of operating conditions, we want sparkless commutation too!"

B-b-u-t-t... "No buts" said Mr. Rubber Mill Man, "that's *exactly* what we need. You see, we're experimenting with new materials on our rolls, and since we can't *pre*-determine best roll speeds for them, we must have a drive that'll give us complete *range* of speeds, and at the same time, complete *protection* for our workers".



"In A Nutshell, you and the control engineers must design a calender drive system that'll give us *higher* and *lower* calender speeds, *closer* speed regulation and *sudden* emergency stopping — *all three!*" Well, we set up meetings between the control and motor designers to plan a *coordinated* design that would meet the needs.

An Automatic Speed Control incorporating both our m-g set and "Regulex" exciter was designed to hold selected speed within close limits. And, after a careful analysis of required load characteristics, we designed a 400 hp d-c motor of low inertia for quick stopping . . . and which also provided speed range from 25 to 250 rpm.



Remember That 14" Stop? After the system went in, we stopped the rolls first at 18" . . . easy. Then at 14" . . . at 12" . . . at 9"! And we probably would have stopped 'em even shorter but for possible danger of too sudden stops to the calender gear system. And commutation? After 6 months, the operators say it's perfect. A 2048

Moral: Every time Allis-Chalmers discovers new ways of solving *special* motor problems, like this one, it also learns how to build better *standard* motors for you! Watch for these new and better motors from A-C. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

Wait 'til you see the NEW

ALLIS-CHALMERS MOTORS!

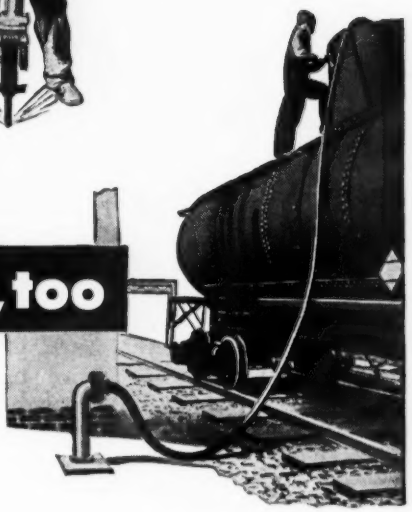
HELPFUL HOSE HINTS

A is for AIR hose

meaning Goodyear Emerald Cord, first choice of industry for long-wearing, heavy-duty service on air tools

—and ACID hose, too

another Goodyear leader you ought to know



YES, Goodyear Acid Suction and Conducting Hose is standout, too, in its field. It is made in four styles, built of different compounds that, among them, withstand practically all types of commercial solutions — including solutions containing 75% phosphoric acid or 50% sulphuric—used in steel mills; tanneries; fertilizer, starch, vinegar, chemical and general industrial plants.

Just tell the G.T.M.—Goodyear Technical Man—what you are handling and he will specify the right hose for any job. Like all Goodyear Industrial Rubber Products — Belting, Hose, Molded Goods, Packing—you'll find it tops in performance, lowest in ultimate cost. To order: phone your nearest Goodyear Industrial Rubber Products Distributor, or write Goodyear, Akron 16, Ohio or Los Angeles 54, California.

Emerald Cord—T.M. The Goodyear Tire & Rubber Company

GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GM-Specified STYLE M ACID CONDUCTING HOSE

for general chemical service

A — Tube of long-lived, acid-resistant stock; withstands temperatures up to 150° F.

B — Cotton fabric carcass, each ply frictioned with high-quality rubber firmly bonding tube to cover. Protected from chemical attack by heavy rubber caps at each end.

C — Cover of tough, abrasion-resistant black compound, proof against same acids as tube.

GOODYEAR

THE GREATEST NAME IN RUBBER

1,600,000 LB. STEAM

for Pennsylvania Power and Light

SERVICE

Pennsylvania Power & Light Company, under its progressive policy of continually extending and improving electric service throughout central eastern Pennsylvania, has started construction on a new steam-electric station near Sunbury. This plant, when completed, will be the largest anthracite-fired installation in the country.

SUNBURY STEAM-ELECTRIC STATION

Four new Foster Wheeler steam generators will each supply a continuous capacity of 400,000 lb. steam per hour. These are the largest steam generators to be arranged for direct firing of pulverized anthracite. Unburned carbon loss will be held to a minimum by opposed firing and by reburning fly ash on the furnace floor. Eight Foster Wheeler ball mills – two per unit – will serve these four steam generators.

PULVERIZED ANTHRACITE

Systems for the direct firing of pulverized anthracite were introduced by Foster Wheeler in 1935. The first central station order followed in 1945. Units which were effectively burning the very small sizes of anthracite during this ten-year interval demonstrated their value for central station use.

EXTENDED SURFACE

Extended surface tubes in the convection section of each Sunbury unit provide steam generating surface in less space than the conventional bare tube arrangement.

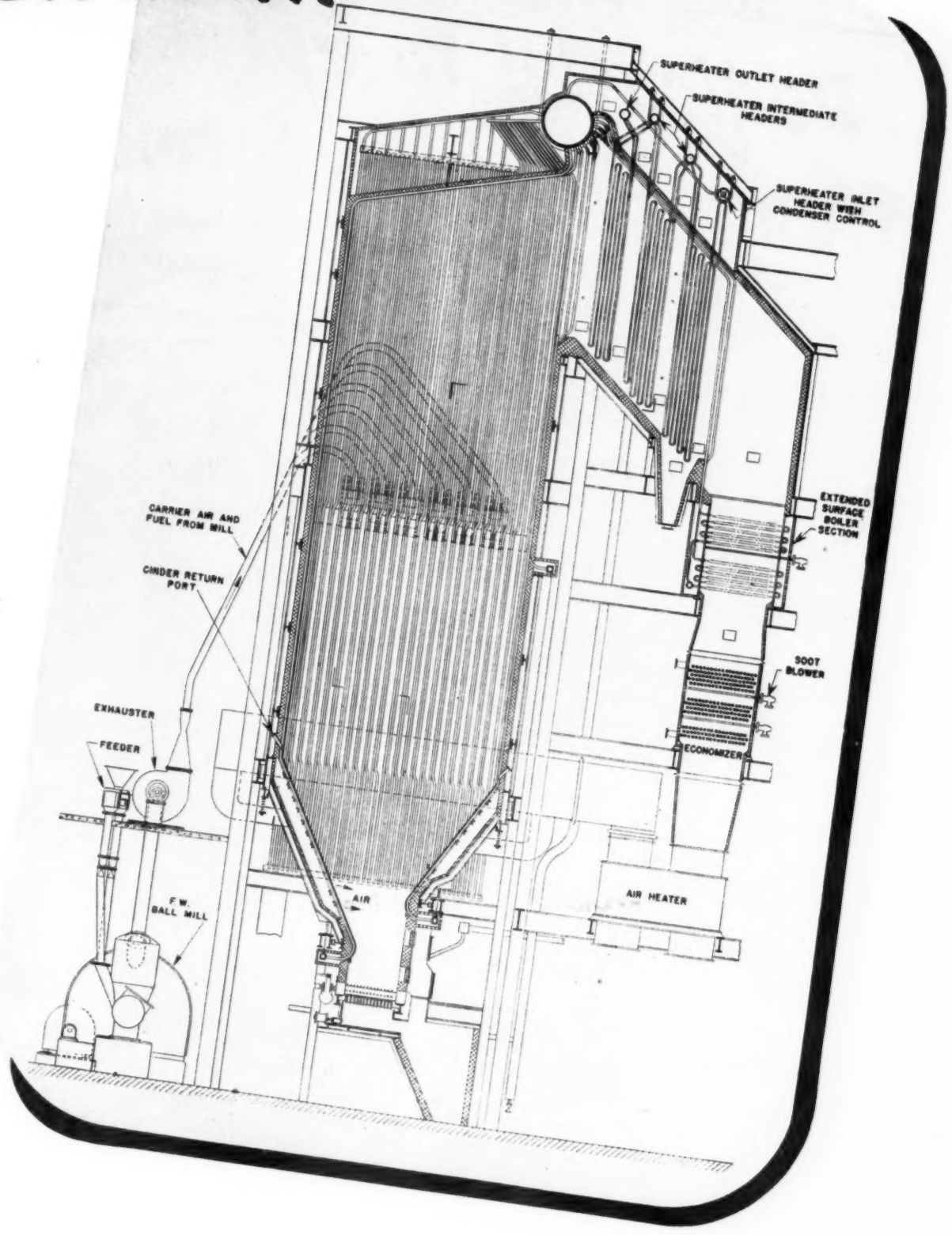
FOSTER WHEELER CORPORATION • 165 Broadway, New York 6, N. Y.

SUNBURY

Number of units	4
Steam Capacity	400,000 lb. per hr.
Design Pressure	1,500 lb. per sq. in.
Superheat Control Range	from 250,000 lb. per hr.
Final Steam Temperature	955 deg. F.
Fuel	Pulverized Anthracite

FW FOSTER

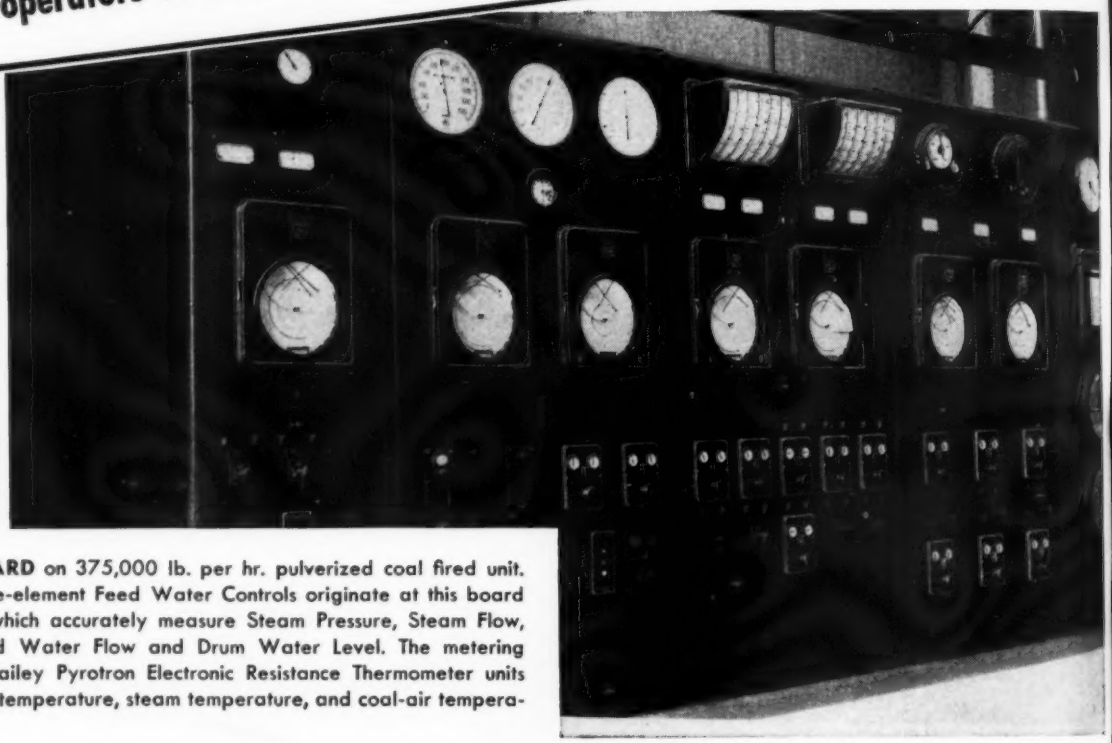
PER HOUR



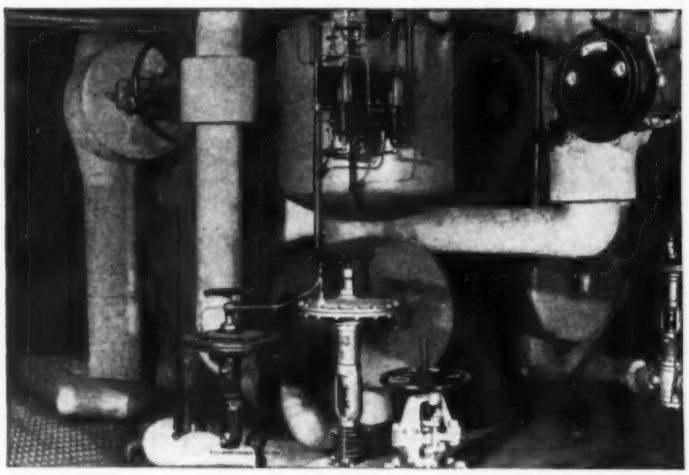
WHEELER FW

Dedicated to Optimum Steam Plant Performance

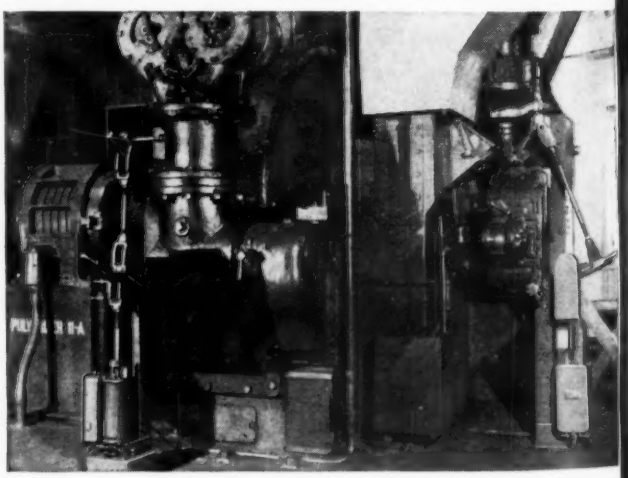
Bailey Controls at Williamsburg Station of Pennsylvania Edison Co. help operators to secure Safety, Economy and Continuity of Service



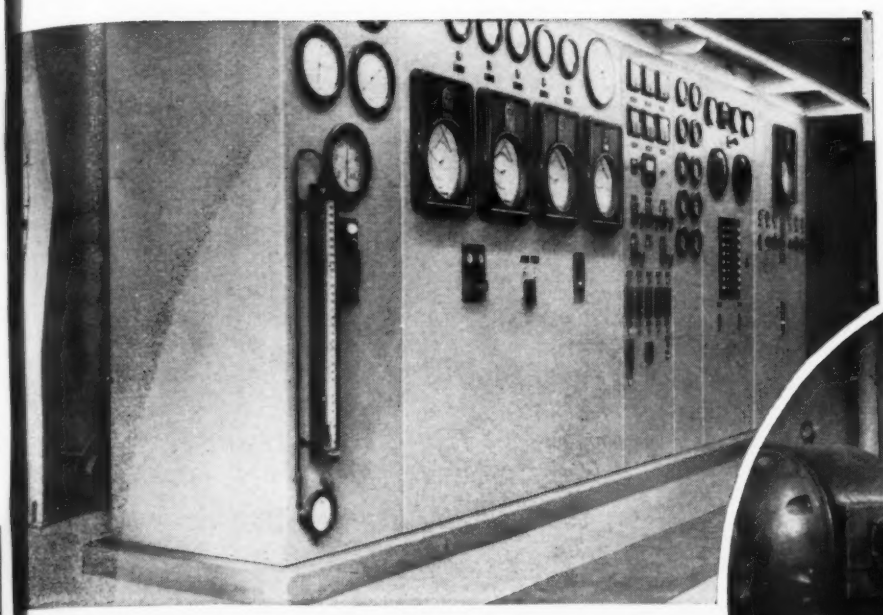
BAILEY BOILER BOARD on 375,000 lb. per hr. pulverized coal fired unit. Combustion and Three-element Feed Water Controls originate at this board from Bailey Meters which accurately measure Steam Pressure, Steam Flow, Air Flow, Draft, Feed Water Flow and Drum Water Level. The metering equipment includes Bailey Pyrotron Electronic Resistance Thermometer units to record feed water temperature, steam temperature, and coal-air temperature at each mill.



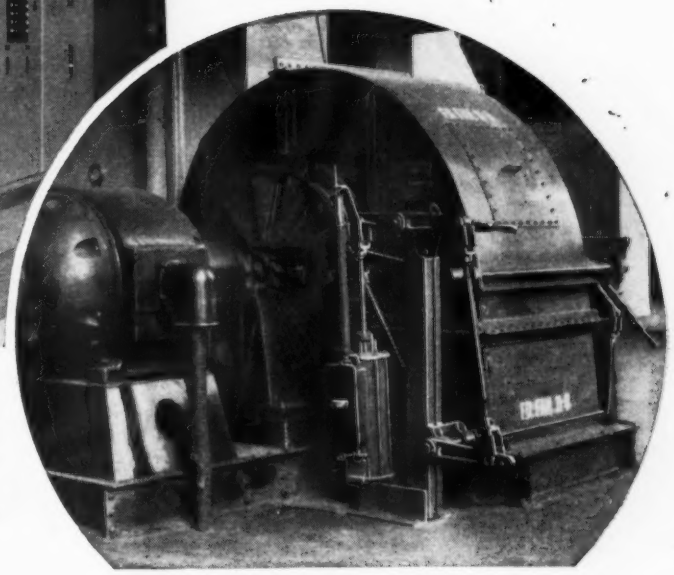
HEATER DRAIN CONTROL. Bailey Level Controller and relays regulate drain valves to maintain the desired high pressure drainer level.



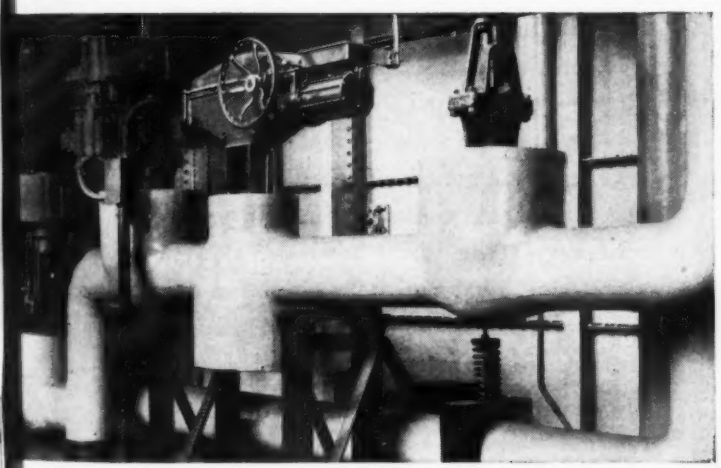
PULVERIZER CONTROL. These Bailey Control Drives regulate raw coal feed and coal-air output from a Riley Atrita Pulverizer in accordance with boiler load demand as measured by the Bailey Master Steam Pressure Controller.



TURBINE BOARD. A Bailey Three-element System of condensate control originates at this board from the first three recording meters which measure: (1) Total flow output from high pressure boiler feed pumps, (2) Condensate flow to No. 1 Heater, (3) Level in No. 3 Heater. The fourth meter records and integrates steam flow to the high pressure turbine and a fifth meter records pressure and temperature of desuperheated steam.

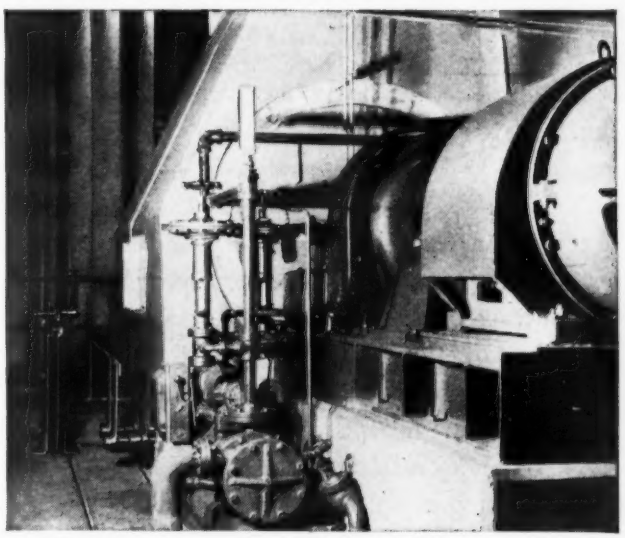


FORCED DRAFT FAN CONTROL. Bailey Control Drives position inlet vanes to supply air for combustion in accordance with the requirements established by the Master Steam Pressure Controller and the Bailey Boiler Meter.



BAILEY THREE-ELEMENT FEED WATER CONTROL VALVE. This powerful valve regulates feed water input to the boiler so that it equals steam output and maintains a safe drum level at all times. Control impulses originate from the accurate measurements of Bailey Meters on the Boiler Board.

All photos by the courtesy of Burns & Roe, Inc. For more information on coordinated Boiler Control Systems, such as installed at the Williamsburg Station, ask for Bulletin 15-C.



INDUCED DRAFT FAN CONTROL. Bailey Control Drive and Valves regulate the induced draft damper and the hydraulic coupling fan speed control to maintain the desired furnace draft.

A-96

BAILEY METER COMPANY

1036 IVANHOE ROAD • • • CLEVELAND 10, OHIO

COMBUSTION • PRESSURE
FEED WATER • LIQUID LEVEL
TEMPERATURE • FEED PUMPS

Controls for Steam Plants

in peacetime as in wartime...

During the war a great many VU Units were purchased by plants all over the country in the course of industry's "all-out" effort to produce everything from atom bombs to anchors. "But didn't all equipment manufacturers sell plenty of equipment then?", you say. True enough. It was an emergency. No time for careful analysis — little opportunity to evaluate details of design or factors involving economy and dependability. "How soon can we get it?" was the No. 1 question.

But since the war ended, industry has been looking at things differently. Although in many instances its needs are urgent, its program is now long range. Once again details of design and construction are weighed carefully. Once again a service-proved reputation for economy and dependability is of first importance.

Of special significance then is the fact that over a period of eight months following V-J Day, VU Units with an aggregate capacity of more than 8,800,000 lb of steam per hr have been ordered — more capacity than in any comparable period during the war years when the demand for steam generating equipment reached an "all-time" high. These units have been purchased by leading companies in many branches of industry and in the utility field — companies whose engineering judgment is of the highest order.

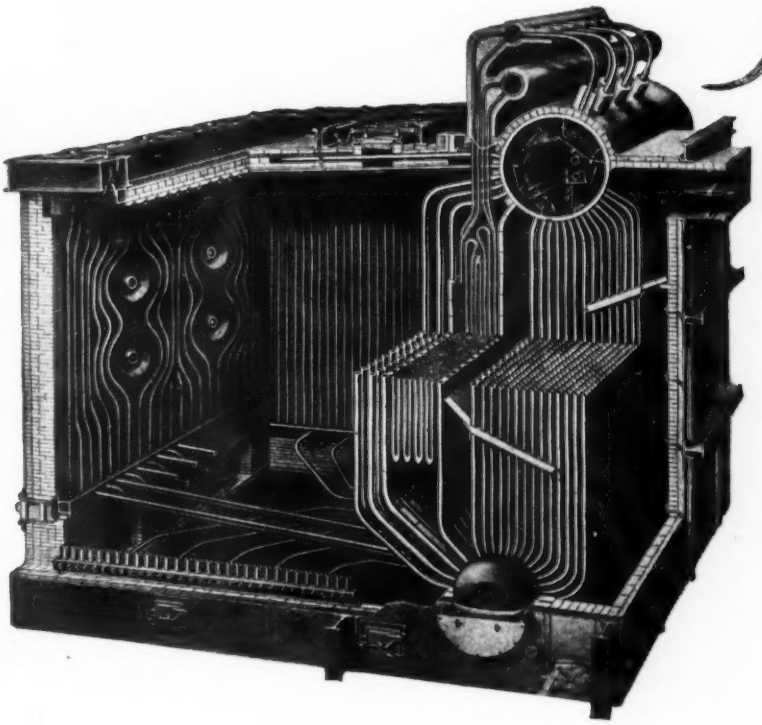
This widespread confidence in VU performance is a reflection of the many advantages listed on the opposite page. Evaluate them point for point. Then you will understand why the VU Unit is so widely regarded as the best steam generator of its type. A-968

APPLICATION RANGE — Type VU installations cover a range of capacities from 30,000 to 300,000 lbs of steam per hr, with pressures up to 1000 psi and total steam temperatures up to 900F; adaptable to firing by pulverized coal, oil, gas or any type of stoker.

COMBUSTION

C-E PRODUCTS INCLUDE ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

it's the VU unit



Consider these 6 Advantages:

1. **Symmetrical Design.** Any longitudinal section through the VU Unit is the same as any other. Each has the same amount of furnace volume, the same evaporative surface, the same superheating surface. Each functions under similarly uniform conditions — same mass flow of gases at practically the same temperatures at any given point. Thus each carries the same amount of water and produces the same amount of steam.

2. **Steam Quality.** All of the most active steam producing tubes enter a baffled area in the drum — see illustration — which discharges well above the waterline and uniformly across the full length of the drum. This arrangement reduces turbulence to a minimum and permits effective utilization of the entire steam release space. Dry steam and a stabilized water level are thus assured even under adverse conditions.

3. **Standardized Construction.** Painstaking refinement of detail is incorporated in each unit at a fraction of the original engineering cost. With standard parts and structural features, the merits of which are confirmed by experience, manufacturing and erection costs are materially reduced. First cost reflects the economy of standardized design and the buyer gains this benefit even before the VU Unit is placed in operation.

4. **Overhead Suspension.** Complete freedom of expansion in all directions is assured because all parts of the unit are suspended from the steel structure which provides the framework for the steel casing. This feature makes ample provision for the effects of temperature changes; it eliminates abnormal mechanical stresses on all pressure parts and explains to a large degree the freedom of the VU Unit from leaky joints.

5. **Adaptable in Application.** The VU Unit may be fired by pulverized coal, oil, gas or any combination of these fuels. It is likewise readily adaptable to firing by any type of stoker. These units are suitable for widely varying requirements of load, pressure and temperature. Inclusion of an interbank or intertube superheater, an air heater or economizer, is easily accomplished as conditions require.

6. **Steel Encased Setting.** The unit setting of shaped tile, refractory and 100% insulation are attractively finished by a permanent outer steel casing. This design, evolved from careful study and experiment, reduces to a minimum heat losses caused by radiation and air infiltration. It tends to eliminate hot spots and helps maintain a uniformly low surface temperature throughout the steel casing. Maintenance is negligible.

E N G I N E E R I N G

200 MADISON AVENUE, NEW YORK 16, N. Y.

Scovill Tube News

Vol. 4 SCOVILL MANUFACTURING COMPANY, Waterbury 91, Conn. No. 2

Resistance to Erosion-Corrosion

It is characteristic of condenser tube alloys to form protective films of corrosion products which greatly reduce further attack. Some alloys develop continuous, insoluble, adherent, non-porous, self-healing films that are more resistant to erosion than others. Such alloys are selected for operating conditions suspected of accentuating the causes of tube erosion-corrosion. Aluminum Brass and Cupro-Nickel tubes have been found to have very high resistance to this type of attack. In some instances, however, the conditions are inherently so severe, even after all known practical remedies have been applied, that tube life of the most resistant alloy is short because of rapid and repeated destruction of protective surface films.

Mechanism of Erosion-Corrosion

The term Erosion-Corrosion has been selected to describe the type of attack generally discussed under the names of impingement attack, inlet-end corrosion, and air attack. Any continual abrasion of the tube surfaces by water containing entrained air or suspended solids, tends to break down, and prevent the formation of the protective film over the metal surfaces, thus exposing the clean metal to the progressive corrosive action of the circulating water. The attack is, therefore, combined erosion-corrosion — erosion removing the protective film, allowing subsequent corrosion of the clean metal surface. The seriousness of this action, which is a mechanical breakdown of the film, is dependent on the velocity of the water, the percent and size of entrained air bubbles, the presence of abrasive suspended solids and the composition of the tube alloy.

The attack may be localized at the inlet ends of the first pass (Fig. 1) or might extend over the whole length of the tube (Fig. 2) due to general erosion-corrosion of the metal.

The result of the action is a very irregular roughening and thinning of the tube wall.

In some cases the attack is concentrated in specific zones in the water box of a condenser, indicating that the causes are due to factors in the hydraulic cycle. Sometimes the occurrence of a rotating motion of the water in the inlet water box tends to form a low pressure area resulting in air bubbles of critical size collecting in the center of rotation. Attack is more severe on the tubes delivering this portion of the water. Other factors also result in localized tube failures; however, most failures of this type suggest a maintenance and routine inspection of the entire hydraulic system,

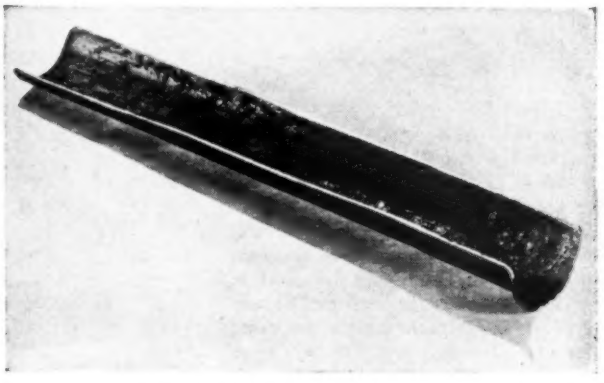


Fig. 1. Inlet End Erosion-Corrosion

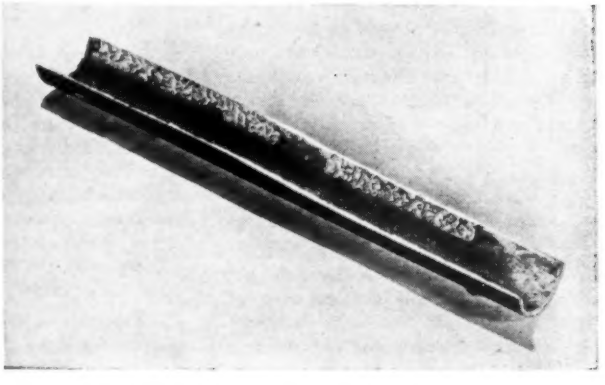


Fig. 2. General Erosion-Corrosion

starting at the intake water canal in order to determine the true cause of premature tube failure due to erosion-corrosion.

Mechanical Factors Contributing to Erosion-Corrosion

Air in the circulating water is in general the most direct cause of erosion-corrosion; however, any condition which creates air bubbles in water is a possible source of trouble. The source of bubbles may be from air entrained mechanically or from dissolved air released at low pressure areas or by turbulence. If adequate attention is given to the elimination of the source of released or entrained air, erosion-corrosion will be kept at a minimum. Some of the elements contributing to erosion-corrosion, that should be inspected for pressure differentials promoting the formation of pockets, turbulence and eddies, are included in the following list:

1. location of intake
2. pump suction bells
3. pump suction lift
4. non-vented air pockets
5. position of valve bonnets
6. pump thrust rings
7. pump gland seal
8. wear on pump blades
9. streamlining of reinforcing ribs, injection nozzle, inspection doors
10. venting of water boxes
11. projection of tube ferrules

Streamlining in the hydraulic system will minimize possible release of air. Belling of the tube ends to a proper hydraulic radius helps minimize localized turbulence (Fig. 3).

In general, erosion-corrosion depends on the presence of air or suspended abrasive solids in water

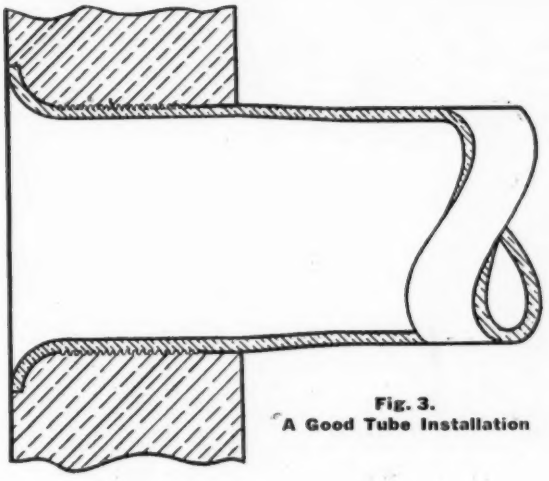


Fig. 3.
A Good Tube Installation

circulating at high velocities and is caused by conditions outlined above. For these conditions Cupro-Nickel or Aluminum Brass tubes normally would be considered most suitable.

Three Scovill Services

Service in Manuals, of which "Scovill Tube News" is a sample, consists of literature providing the latest, most authentic information* on condenser and heat exchanger tubes, which has its source in the broad experience of our engineers and the findings of our laboratories. *Service in Men* offers specialized consultation on individual tube application problems and suggestions regarding alloy selection and tube installation practice. *Service in Metals* includes the production of a broad range of tube alloys under laboratory control, which verifies that Scovill alloys selected conform to requirements of specifications.

*For a free copy of the "Scovill Condenser Tubes" booklet, address Scovill Manufacturing Company, 13 Mill Street, Waterbury 91, Conn. *Export Department:* 405 Lexington Ave., New York 17, N.Y.

This is Number Eighteen in a series of Scovill advertisements to help you get longer life from condenser and heat exchanger tubes.

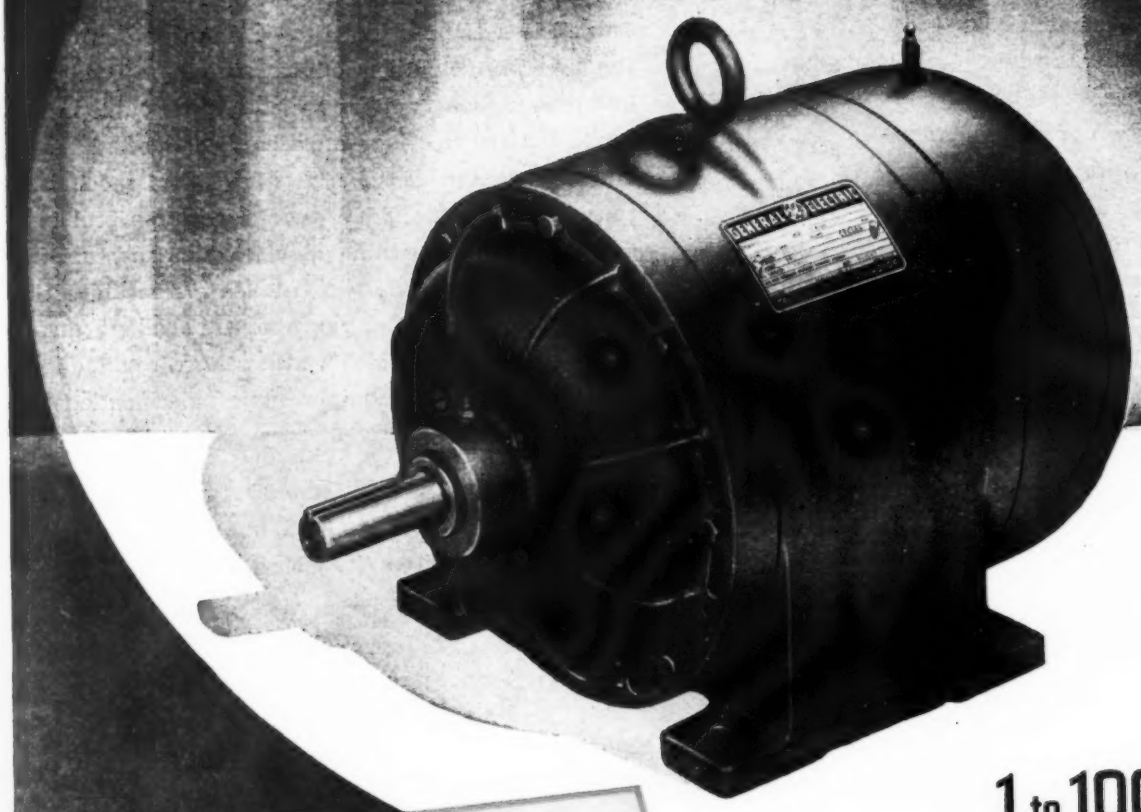
SCOVILL

SCOVILL CONDENSER TUBES

ONE PRODUCT... THREE SERVICES

Service in Manuals... Service in Metals... Service in Men

GENERAL ELECTRIC Announces



1 to 1000 hp

COMPLETE ENCLOSURE FOR PROTECTION AGAINST DIRT, DUST, AND WEATHER

NEW

Totally Enclosed

TRI/CLAD MOTORS

REG. U.S. PAT. OFF.

In 1940, G.E. introduced the Tri-Clad open motor—with emphasis on the feature that industry wanted most in a motor, *protection.* Since then, more Tri-Clads have gone into service than any other integral-horse-power motor.

Today, we are ready with a new line of Tri-Clad motors—*totally enclosed, fan-cooled motors*—built on Tri-Clad design principles in both standard and explosion-proof types.

We believe that these are industry's most dependable motors. They are designed specifically for use in many adverse atmospheres—in iron dust, outdoors, in hazardous areas, and chemical atmospheres. Their scope of application is as wide as the field of industrial motor use. Safeguarded against most sources of motor damage, their longer life and lower maintenance will make them economical motors for use on almost every job. *General Electric Company, Schenectady 5, New York.*

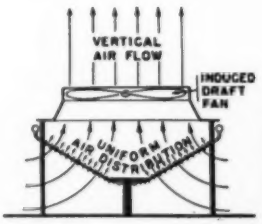
GENERAL ELECTRIC

ALCO Solves Another Major

ALCO service to power plants comprises numerous items, among which heat exchangers in one form or another predominate. It is natural, therefore, to think of ALCO particularly when you are confronted with any problem involving heat exchangers. Among the most difficult of such problems are those where cooling water is limited, expensive, or scale forming.

In such circumstances ALCO *Air-Cooled* Heat Exchangers do an efficient job of jacket water cooling, lubricating oil cooling, steam condensing, gas cooling, or vapor cooling. Moreover, a single ALCO Air-Cooled Heat Exchanger can be used to do several jobs simultaneously, and can be operated with practically any drive—electric motor, diesel or gasoline engine, steam turbine.

Each of the battery, shown at right, cools jacket water for a diesel engine pipe line compressor and is designed to operate at 100° F. maximum air temperature. The diagram below shows how the uniform air distribution, induced draft operation, and vertical air-flow principle in ALCO Air-Cooled Heat Exchangers permit high efficiency at all times, regardless of wind direction or velocity.



WRITE FOR ALCO BULLETIN CONTAINING FULL DESCRIPTION, ILLUSTRATIONS, AND ENGINEERING DATA.

American Locomotive Company, 30 Church Street, New York 8, N. Y.
Beaumont Iron Works, Beaumont, Texas

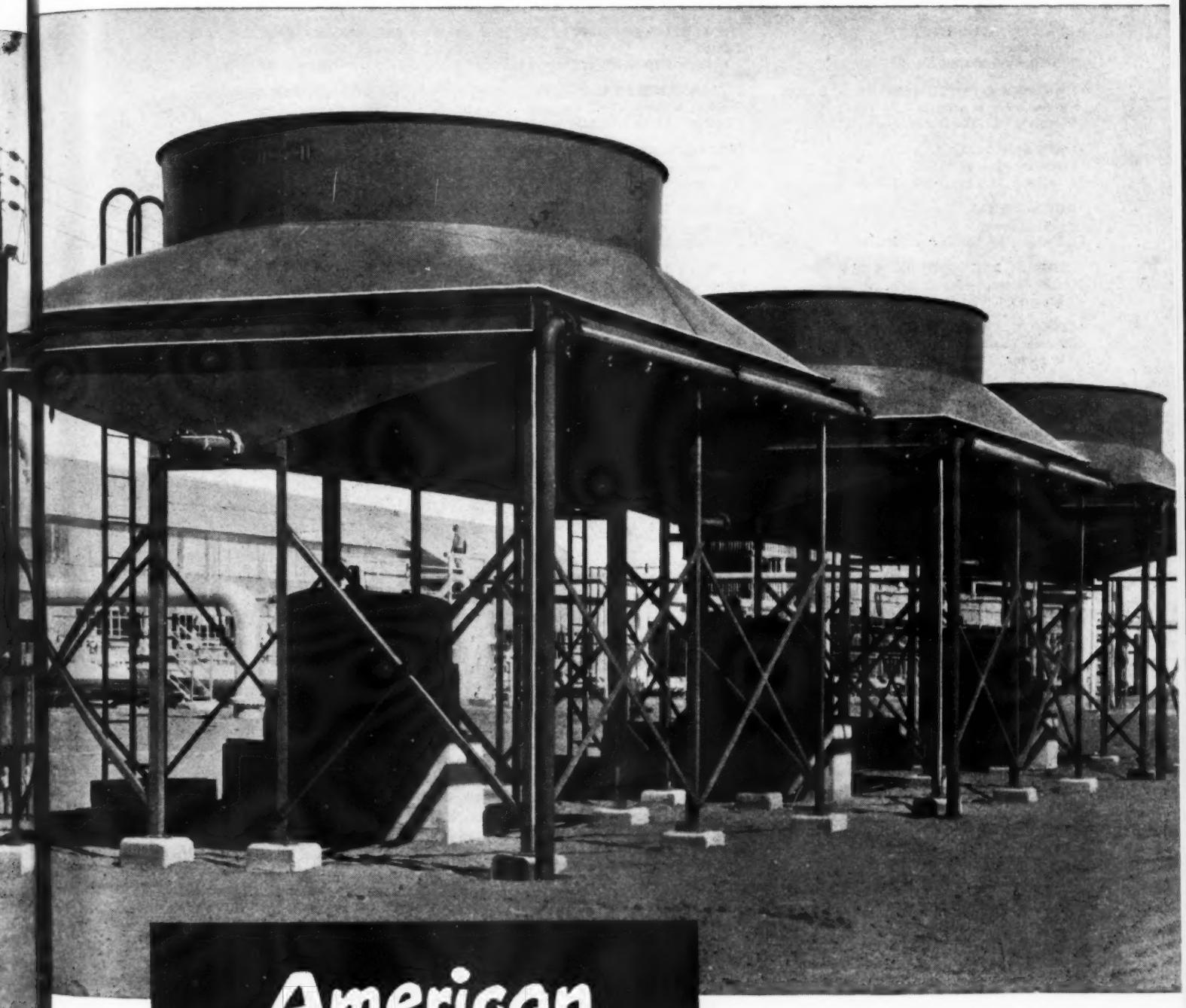
ALCO PRODUCTS FOR POWER PLANTS

Evaporators • Closed-Type Feedwater Heaters • Evaporator Condensers • Diesel Engines • Stationary and Marine • Diesel Waste Heat Boilers • Jacket Water Coolers • Lubricating Oil Coolers • Fuel Oil Heaters • Oil Tank Suction Heaters • Condensers • Generator Air Coolers • Condensate Coolers • Prefabricated Piping • Blowdown Exchangers.

BEAUMONT IRON WORKS COMPANY

Manufacturers of Electric Steel and Alloy Castings, Dreadnaught Rotary Drilling and Production Equipment, including: Draw Works, Crown Blocks, Traveling Blocks, Coring Reels, Tubing Heads and Well Heads.

Problem for Power Plants



American Locomotive

Alco

THE MARK OF MODERN ENGINEERING

TYPICAL REPUBLIC AUTOMATIC

SPREADER STOKERS

ALLIS-CHALMERS MFG. CO.
Springfield, Ill.
2 boilers: 68,000 lb./hr. each: 160 lb.

ALLIED CHEMICAL & DYE CO.
Chicago, Illinois
1 boiler: 45,000 lb./hr.: 125 lb.

BUICK AVIATION PLANT
Melrose Park, Illinois
1 boiler: 90,000 lb./hr.: 175 lb.

CHICAGO & NORTHWESTERN R. R. CO.
Green Bay, Wisconsin
2 boilers: 25,000 lb./hr. each: 125 lb.

DAIN MFG. CO.
Ottumwa, Iowa
2 boilers: 518 hp. each: 175 lb.

HUBINGER CO.
Keokuk, Iowa
1 boiler: 150,000 lb./hr.: 500 hp.

CLINTON ENGINEERING WORKS
Oliver Springs, Tenn.
3 boilers: 40,000 lb./hr. each: 300 lb.

CLINTON ENGINEERING WORKS
Clinton, Tenn.
3 boilers: 50,000 lb./hr.: 175 lb.

NORTHWESTERN YEAST CO.
Chicago, Illinois
1 boiler: 338 hp.: 140 lb.
2 boilers: 253 hp.: 140 lb.

MARSHALL CANNING CO.
Marshalltown, Iowa
1 boiler: 40,000 lb./hr.: 160 lb.

KRAFT FOODS
Hutchinson, Minn.
2 boilers: 316 hp. each: 150 lb.

KRAFT FOODS
Albany, Minn.
2 boilers: 338 hp. each: 160 lb.

PYRAMID COAL CORP.
Pinchnieyville, Illinois
3 boilers: 40,000 lb./hr. each: 210 lb.

WALWORTH CO.
Kewanee, Illinois
1 boiler: 60,000 lb./hr.: 200 l

SCHENLEY DISTIL
Lawrenceb
2 boi

RGINGS CORP.
Harbor, Indiana
oiler: 30,000 lb./hr.: 150 lb.

U. S. NAVAL TRAINING STATION
Farragut, Idaho
2 boilers: 412 hp. each: 100 lb.
2 boilers: 350 hp. each: 100 lb.
4 boilers: 250 hp. each: 100 lb.
2 boilers: 500 hp. each: 100 lb.

CHAIN GRATE STOKER

ADAMS & WESTLAKE CO.
Elcart, Indiana
2 boilers: 500 hp. each: 125 lb.

BETHLEHEM STEEL CO.
Bethlehem, Pa.
4 boilers: 600 hp. each: 160 lb.

THE BERYLLIUM CORP. OF PA.
Temple, Pa.
2 boilers: 22,500 lb./hr. each: 145 lb.

BLESSING HOSPITAL
Quincy, Illinois
1 boiler: 150 hp.: 100 lb.

CHICAGO, NORTHWESTERN R. R.
Chicago, Illinois
3 boilers: 45,000 lb./hr. each: 160 lb.

CLINTON PRODUCTS CO.
Clinton, Iowa
2 boilers: 25,000 lb./hr. each: 200 lb.

CORN PRODUCTS REFINING CO.
Pekin, Illinois
1 boiler: 175,000 lb./hr.: 400 lb.

HOUDAILLE HERSHEY CORP.
Decatur, Illinois
4 boilers: 25,000 lb./hr. each: 125 lb.

HOOSIER LAMP & STAMPING CORP.
Evansville, Indiana
1 boiler: 400 hp.: 150 lb.

MURRAY CORPORATION OF AMERICA
Scranton, Pa.
2 boilers: 35,000 lb./hr. each: 125 lb.

KREY PACKING
St. Louis, Mo.
1 boiler: 400 hp.: 350 lb.

ROCKFORD MITTEN & HOSIERY CO.
Rockford, Illinois
2 boilers: 400 hp. each: 110 lb.

U. S. RUBBER CO.
Passaic, New Jers
2 boilers: 40
2 boil

lb./hr. each: 125 lb.
32,000 lb./hr. each: 125 lb.

U. S. MARINE HOSPITAL
Klamaith Falls, Oregon
4 boilers: 500 hp. each: 100 lb.

REPUBLIC RUBBER DIVISION
Youngstown, Ohio
1 boiler: 65,000 lb./hr.: 450 lb.

ALUMINUM FORGINGS, INC.
Erie, Pa.
3 boilers: 50,000 lb./hr. each: 145 lb.

GRIESEDIECK WESTERN BREWERY
Belleville, Illinois
1 boiler: 600 hp.: 125 lb.

UNDERFEED STOKERS

EDWARD G. BUDD MFG. CO.
Philadelphia, Pa.
3 boilers: 100,000 lb./hr. each: 150 lb.

CHEVROLET MOTORS
Bay City, Michigan
1 boiler: 600 hp.: 150 lb.

INDEPENDENT PNEUMATIC TOOL CO.
Aurora, Illinois
1 boiler: 300 hp.: 300 lb.

THE OLD QUAKER CO.
Lawrenceburg, Indiana
2 boilers: 500 hp. each: 160 lb.

REO MOTORS, INC.
Lansing, Michigan
1 boiler 40,000 lb./hr.: 260 lb.

ST. JOHN'S HICKEY MEMORIAL HOSPITAL
Anderson, Indiana
2 boilers: 150 hp. each: 150 lb.

U. S. FINISHING CO.
Norwich, Conn.
1 boiler: 40,000 lb./hr.: 165 lb.

UPJOHN COMPANY
Kalamazoo, Michigan
1 boiler: 40,000 lb./hr.: 160 lb.

U. S. MARINE AIR STATION
Cherry Point, North Carolina
3 boilers: 55,000 lb./hr. each: 175 lb.

MILITARY VEHICLE & FIN
Detroit, Michigan
3 boilers: 28,0

NG PLANT
lb./hr. each: 150 lb.

MBUS ASF DEPOT
Columbus, Ohio
1 boiler: 26,000 lb./hr.: 90 lb.

MUNICIPAL WATER & LIGHT PLANT
St. Marys, Ohio
2 boilers: 35,000 lb./hr. each: 235 lb.

TIMKEN ROLLER BEARING CO.
Columbus, Ohio
1 boiler: 60,000 lb./hr.: 400 lb.

U. S. MILITARY ACADEMY
West Point, N. Y.
2 boilers: 100,000 lb./hr. each: 160 lb.
1 boiler: 120,000 lb./hr.: 160 lb.

U. S. NAVY YARD
Charleston, S. C.
2 boilers: 20,000 lb./hr. each: 160 lb.

GEO. WIEDEMANN BWG. CO.
Newport, Ky.
1 boiler: 456 hp.: 125 lb.

REPUBLIC
Are Being
FOR ALL SIZES OF BOILERS AND

COMBUSTION CONTROL INSTALLATIONS

PULVERIZED COAL

BELTON MILLS
Belton, South Carolina
1 boiler: 60,000 lb./hr.: 250 lb.

BOECKELER ASSOCIATES
Trenton, Michigan
1 boiler: 528 hp.: 125 lb.

GEORGIA POWER COMPANY
Harryat, Georgia
1 boiler: 600,000 lb./hr.: 975 lb.

HARTFORD CITY PAPER COMPANY
Hartford City, Indiana
1 boiler: 80,000 lb./hr.: 325 lb.

CLINTON ENGINEERING WORKS
Oliver Spriggs, Tenn.
1 boiler: 750,000 lb./hr.: 1375 lb.

U. S. NAVY YARD
Portsmouth, Virginia
1 boiler: 120,000 lb./hr.: 380 lb.

WRIGHT FIELD
Dayton, Ohio
1 boiler: 100,000 lb./hr.: 300 lb.

N. Y., N. H. & HARTFORD R. R. CO.
Cos Cob, Conn.
1 boiler: 150,000 lb./hr.: 325 lb.

PRATT & WHITNEY
East Hartford, Conn.
2 boilers: 20,000 lb./hr. each: 175 lb.

U. S. MARINE BARRACKS
Quantico, Virginia
1 boiler: 120,000 lb./hr.: 125 lb.

CENTRAL ILLINOIS PUBLIC SERVICE CO.
Hutsonville Station
Hutsonville, Ill.
2 boilers: 150,000 lb./hr. each: 665 lb.

COMMONWEALTH EDISON CO.
Northwest Station
Chicago, Illinois
3 boilers: 425,000 lb./hr. each: 1325 lb.

NORFOLK NAVY YARD
Portsmouth, Va.
3 boilers: 120,000 lb./hr. each: 400 lb.

NORTHERN PAPER MILLS
Green Bay, Wis.
2 boilers: 75,000 lb./hr. each: 650 lb.

WILLIAMSBURG POWER PLANT
Brooklyn, N. Y.
2 boilers: 375,000 lb./hr. each: 875 lb.

OIL FIRED

BAY REFINING CORP.
Bay City, Michigan
1 boiler: 350 hp.: 245 lb.

FITCHBURG GAS & ELEC. LIGHT CO.
Fitchburg, Mass.
2 boilers: 120,000 lb./hr. each: 200 lb.

PHILADELPHIA NAVY YARD
Philadelphia, Pa.
2 boilers: 130,000 lb./hr. each: 175 lb.

U. S. NAVAL HOSPITAL
Oakland, California
5 boilers: 490 hp. each: 125 lb.

U. S. NAVAL MAGAZINE
Port Chicago, California
3 boilers: 210 hp. each: 125 lb.

U. S. NAVAL HOSPITAL
San Leandro, California
3 boilers: 500 hp. each: 135 lb.

CITIES SERVICE
Lake Charles, La.
4 boilers: 250 lb./hr. each: 250 lb.
[illegible],000 lb./hr. each: 250 lb.

GAS FIRED

BEECH AIRCRAFT CORPORATION
Wichita, Kansas
2 boilers: 180 hp. each: 100 lb.

GULF POWER COMPANY
Pensacola, Florida
1 boiler: 230,000 lb./hr.: 875 lb.

GENERAL TIRE & RUBBER CO.
Waco, Texas
3 boilers: 16,000 lb./hr. each: 190 lb.

LONG-BELL LUMBER CO.
De Ridder, La.
3 boilers: 250 hp. each: 165 lb.

MATHIESON ALKALI WORKS, INC.
Lake Charles, La.
1 boiler: 420,000 lb./hr.: 925 lb.

MISSISSIPPI POWER CO.
Hattiesburg, Mississippi
1 boiler: 230,000 lb./hr.: 875 lb.

TIDEWATER ASSOCIATED OIL CO.
Avon, California
2 boilers: 100,000 lb./hr. each: 250 lb.

ABERCRAMBIE-HARRISON OIL CO.
Sweeney, Texas
4 boilers: 100,000 lb./hr. each: 250 lb.

COMBINATION FIRING

CROWN CENTRAL PETROLEUM CORP.
Houston, Texas
3 boilers: 75,000 lb./hr. each: 450 lb.
Gas & Oil

KOPPERS UNITED CO.
Kobuta, Pa.
1 boiler: 150 hp.: 165 lb.
Coal & Oil

STANDARD OIL CO. OF NEW JERSEY
Canton, New Jersey
1 boiler: 150,000 lb./hr.: 605 lb.
Gas & Oil

CITY PUBLIC SERVICE
San Antonio, T[illegible]
1 boiler[illegible]
1 b[illegible]

[illegible]SET
[illegible]r.: 605 lb.

[illegible] PUBLIC SERVICE BOARD
San Antonio, Texas
1 boiler: 275,000 lb./hr.: 200 lb.
1 boiler: 200,000 lb./hr.: 200 lb.
Gas & Oil

S & W FINE FOODS, INC.
Redwood City, California
1 boiler: 335 hp.: 105 lb.
Gas & Oil

UTAH OIL REFINING CO.
Salt Lake City, Utah
4 boilers: 65,000 lb./hr. each: 615 lb.
Gas & Oil

U. S. NAVAL OPERATING BASE
Norfolk, Va.
1 boiler: 125,000 lb./hr.: 400 lb.
Pulverized Coal & Oil

PENICK & FORD, LTD. INC.
Cedar Rapids, Iowa
1 boiler: 150,000 lb./hr.: 500 lb.
Gas and pulverized coal

STANDARD OIL CO. OF CALIF.
Richmond, Calif.
3 boilers: 125,000 lb./hr. each: 850 lb.
Gas, oil, acid sludge

LOUISIANA STEAM GEN. CORP.
(Gulf States Utilities)
Baton Rouge, La.
2 boilers: 500,000 lb./hr. each: 670 lb.
Natural gas, oil, pulverized cake, refinery byproducts

THE TEXAS CO.
Port Arthur, Texas
3 boilers: 300,000 lb./hr. each: 615 lb.
Oil and gas

CONTROLS
Specified
ALL TYPES OF FUEL FIRING

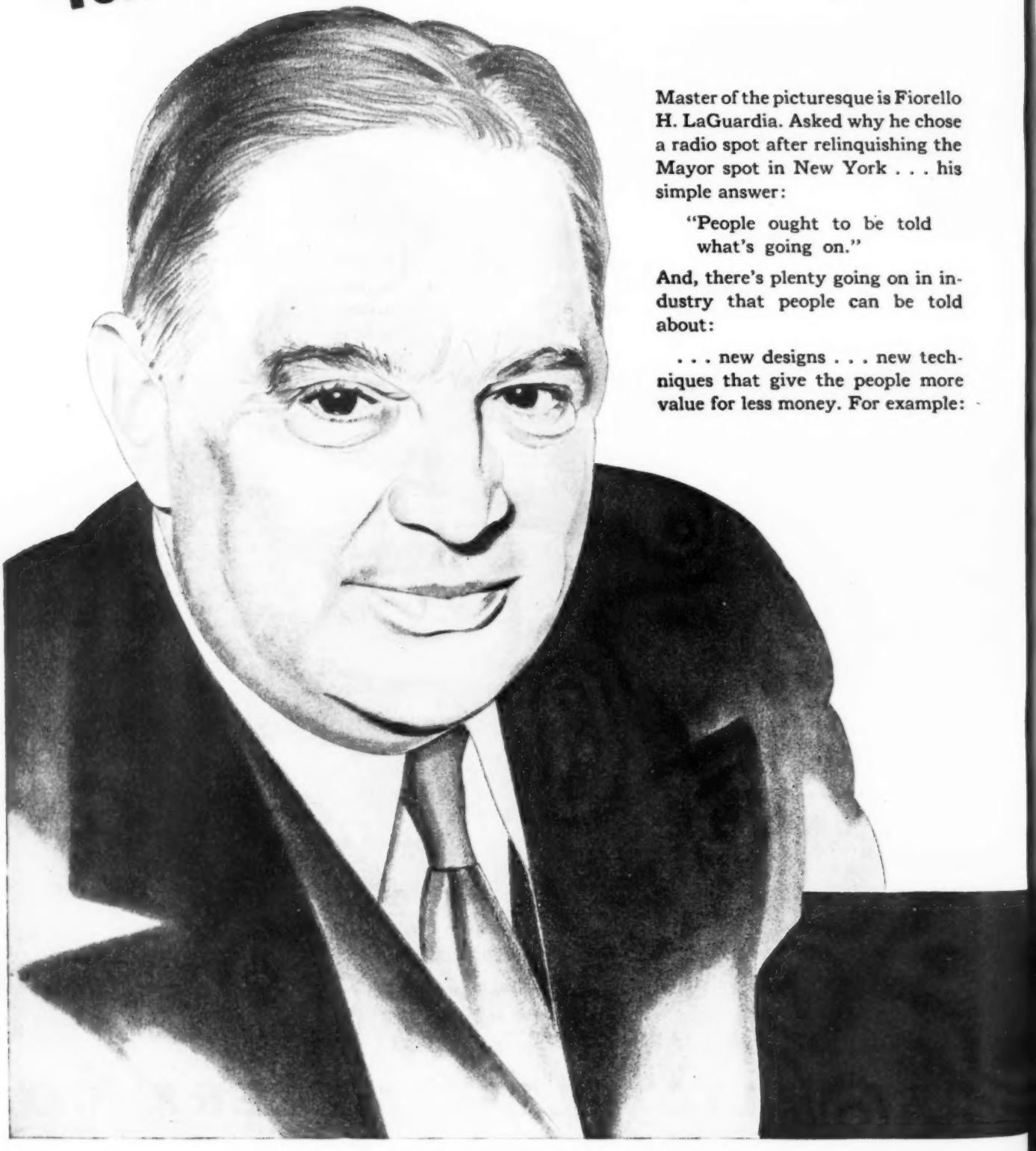
EQUIPMENT ★ ★ FACILITIES ★ PERSONNEL ★ EXPERIENCE ★

REPUBLIC
INSTRUMENTS
AND CONTROLS

REPUBLIC FLOW METERS CO.
2222 Diversey Parkway Chicago 47, Illinois

then he said to himself:

Tell the people what's cookin'



Master of the picturesque is Fiorello H. LaGuardia. Asked why he chose a radio spot after relinquishing the Mayor spot in New York . . . his simple answer:

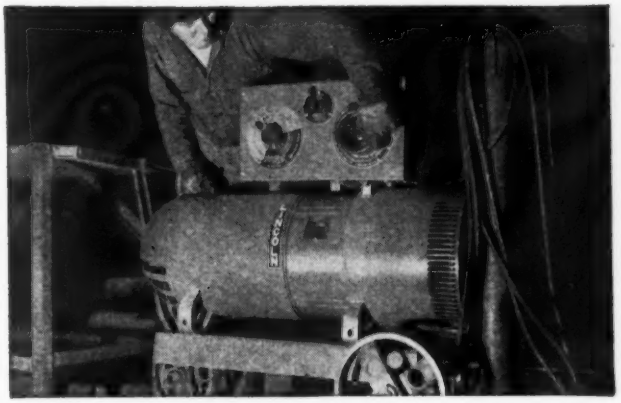
"People ought to be told what's going on."

And, there's plenty going on in industry that people can be told about:

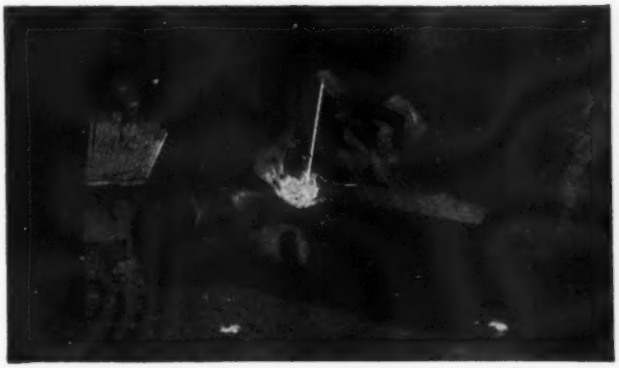
. . . new designs . . . new techniques that give the people more value for less money. For example:

LOOK, Mr. LA GUARDIA: **Here's news the piping field should know:**

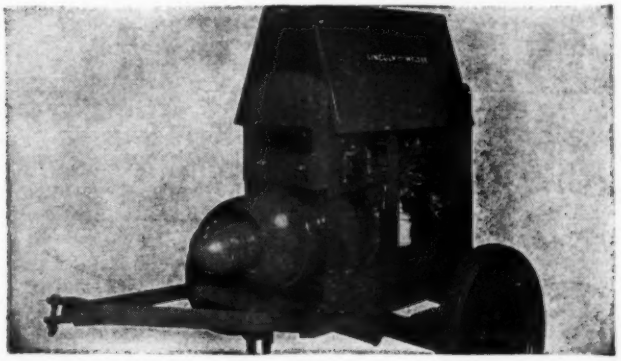
EXPERTS AVAILABLE. Thousands of experienced electric arc welders from war production are available for high-quality, low-cost pipe welding. A little special training (such as provided by Lincoln's Advanced Pipe Welding Course) will fit them for specialized work such as the steam line illustrated.



ACCURATE HEAT FOR QUALITY JOINTS. Lincoln welders provide continuous current control and a "Job Selector" to make it easy to adjust arc heat accurately for all thicknesses of metal. Many contractors cite this flexibility as one of the main reasons for preferring this process to the other welding method.



"5 TIMES AS FAST". More and more piping men are swinging to the electric arc because as one contractor says, "It gives more concentrated heat and welds about 5 times faster than the other method". All piping in this plant, from 1½" up, was welded with Lincoln "Fleetweld 5" Electrode.



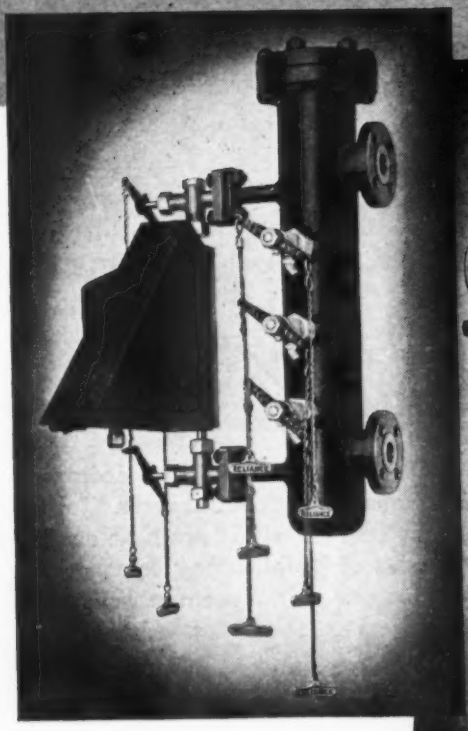
NO ELECTRIC POWER REQUIRED. This Lincoln 200-amp. Engine Driven Welder is the world's most popular pipe welder. Easily portable. D.C.—40 to 250 amps. Welds all metals and alloys . . . thin or heavy. Economical idling device. Rugged 29 H.P. engine. Full details in Bul. 312C.

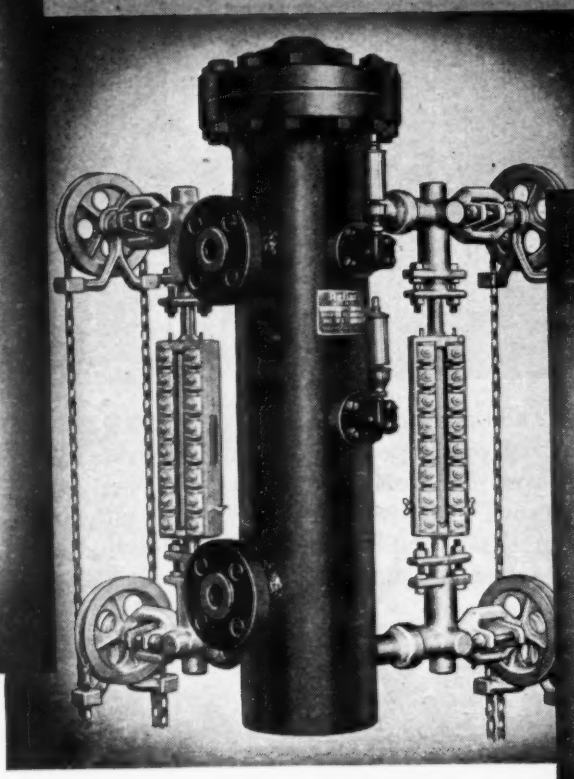
THE LINCOLN ELECTRIC COMPANY • DEPT. 432 • CLEVELAND 1, OHIO

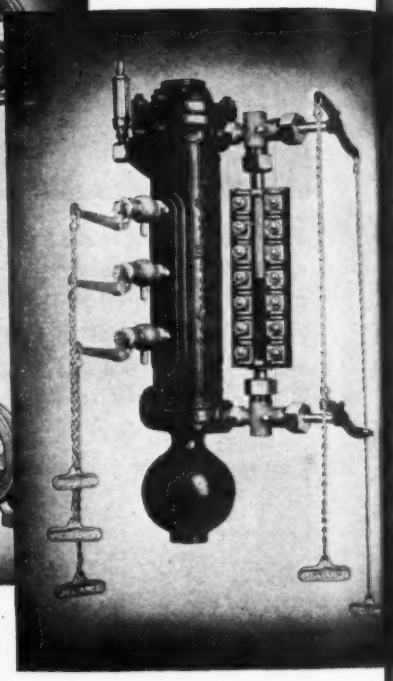
America's greatest natural **recourse**

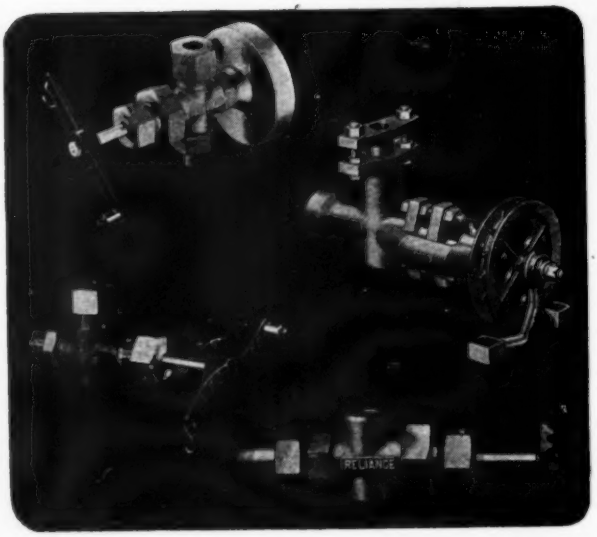
ARC WELDING

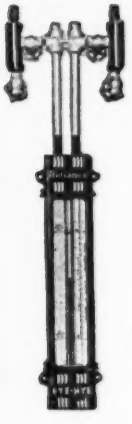
You'll need Reliance water











Since 1884

Reliance

level alarms and indicators

for safe efficient supervision in your new power plant or for modernization or replacement

BEFORE you've completed the list of major and minor equipment and facilities for any power project, you'll be listing necessary ***water level controls and gages.*** As you know, the need for water level safety is a many-sided picture. The interlocking services of various vessels in power plant and process operations call for a varied assortment of gaging facilities.

Reliance Boiler Safety Devices include all the elements of safe water level supervision. Known the world over for accuracy, sturdiness and dependability, there's a Water Column for every type of boiler—any pressure—and gage equipment to suit every water level checking need. . . .

Reliance high and low Alarm Water Columns—sensitive to the slightest water level variation; built for pressures up to 900 lbs.

Reliance Water Columns without alarms—standard and custom built designs for pressures up to 2000 lbs.

Reliance EYE-HYE Remote Reading Water Level Indicator—brings accurate reading down to eye level or special desired position; available for use on any pressure.

EYE-HYE with graduated face plate for tanks and vessels—helps centralize control of out-of-the-way equipment such as heater tanks, surge tanks, water treatment systems.

Reliance Gage Valves and Gage Cocks—dependable in toughest service on water columns or any gage requirement.

Reliance Junior Alarm for flash tanks and other vessels—valuable safety signal of many uses in power plant and process operations.

Reliance Prismatic Gage Insert—contrasty black and white vision for quick error-proof reading. Available in special lengths for vessels having wide range of variation.

Reliance Mica-protected Flat Glass Insert—for safe clear-reading indication on boilers and accessory apparatus.

Reliance Micasight Safety Water Gage Insert—for good vision with utmost safety on highest pressures.

Illuminating Equipment—expertly designed to increase visibility of gage readings, particularly in high and/or obstructed positions.

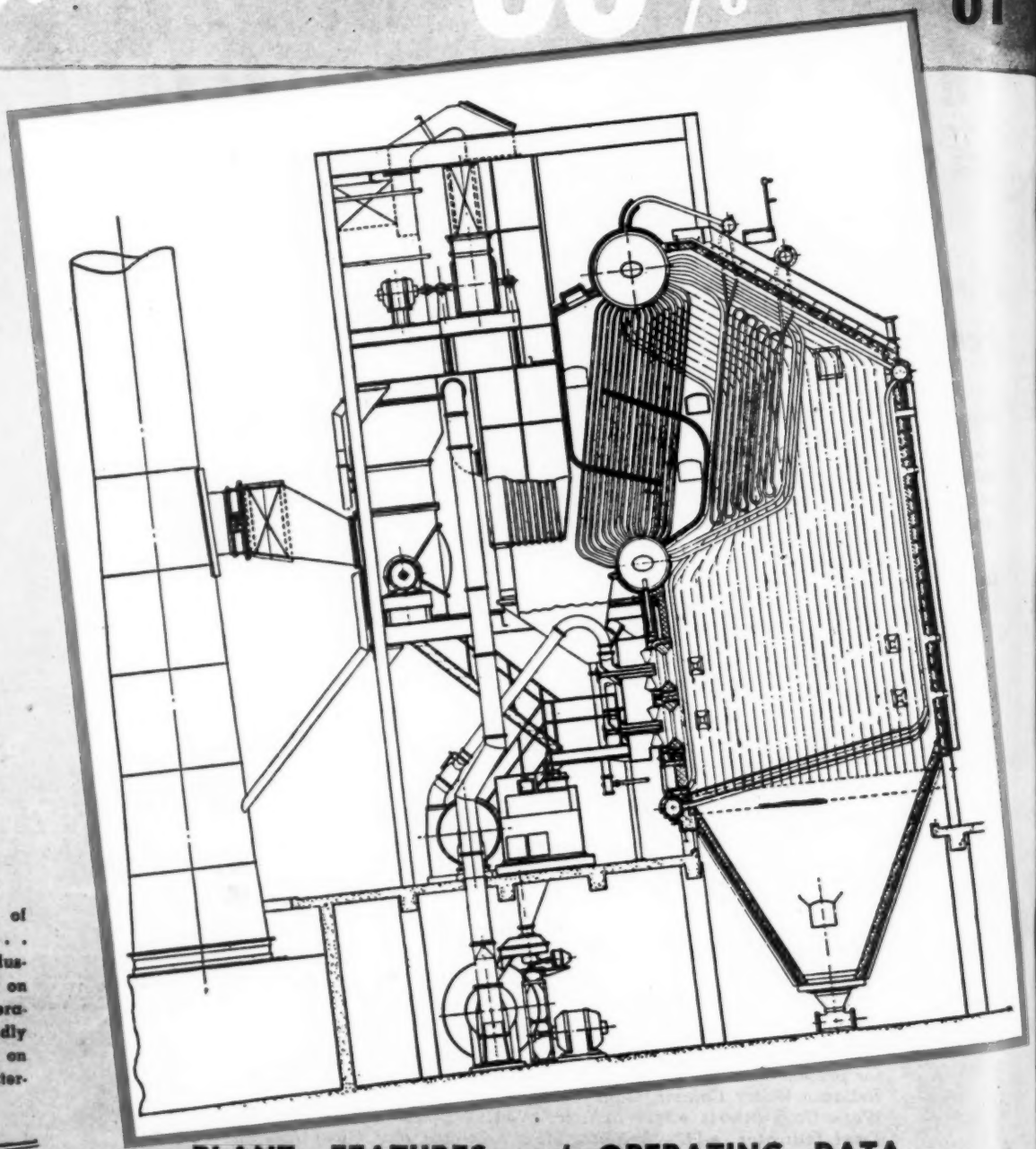
Reliance has specialized for over 60 years—offers you the most complete service in approved devices for water level supervision. Write to 5902 Carnegie Avenue, Cleveland 3, Ohio, for the bulletins that interest you:

•415—Reliance Boiler Alarms and Water Columns without alarms for pressures above 250 lbs •414—Reliance Boiler Alarm Water Columns for pressures to 250 lbs •418—Reliance Water Gage Valves •438—Reliance Water Column Gage Cocks •434—Reliance PRISMATIC *Water Gage Inserts •382—Reliance* EYE-HYE *Remote Reading Liquid Level Indicator •437—Reliance Mica-protected Flat Glass Inserts*

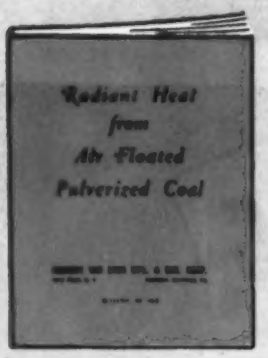
BOILER SAFETY DEVICES

THE RELIANCE GAUGE COLUMN CO.
Cleveland, Ohio

Better than 88% DAILY of



Write for a copy of Bulletin No. 44B . . . a 97-page fully illustrated handbook on modern steam generation practice. Kindly make your request on your company letterhead.



PLANT, FEATURES *and* OPERATING DATA

Plant Owner — Water Treatment Division, E. F. Drew Company, Boonton, New Jersey.

Capacity Boiler — 60,000# steam per hour.

Operating Pressure—500 psi.

Steam Temperature—750° F.

Steam Purity—0.25 parts per million

Guaranteed Efficiency—87.3%

Firing—Pulverized Coal

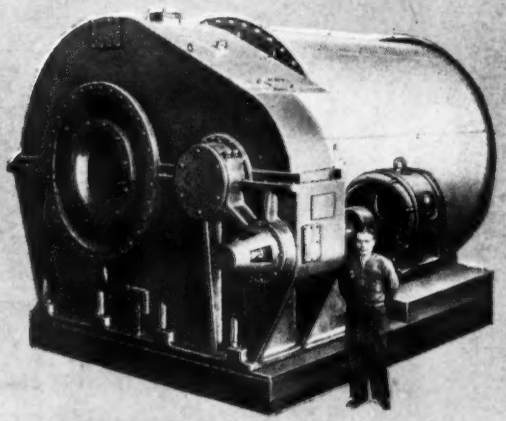
This entire plant was designed and erected under one responsibility . . KVS Engineering Service. Further details will be found on p. 53 of KVS Bulletin No. 44B, available on request.

OPERATING EFFICIENCY

this KVS STEAM GENERATING PLANT

...made possible by FINE PULVERIZATION with KVS AIR SWEPT TUBE MILL

The operating efficiency of this plant, using bituminous coal, exceeds the guaranteed efficiency of 87.3% and is due largely to superfine pulverization.



Kennedy Integral Drive Air Swept Tube Mill which pulverizes the hardest grades of abrasive coal to the desired fineness at minimum cost.

FEATURES OF THE KVS AIR SWEPT TUBE MILL

. . . . operation depends on air passing through mill floating out superfine carbureted product.

. . . . preheated air in desired quantities is drawn through mill from inlet end by a fan driven by a variable speed motor, removing only the impalpable powder, thus controlling fineness of product.

. . . . inasmuch as coal is ground in air, a carbureted fuel is prepared, enabling oxygen and carbon to combine for infinitely quicker true radiant combustion.

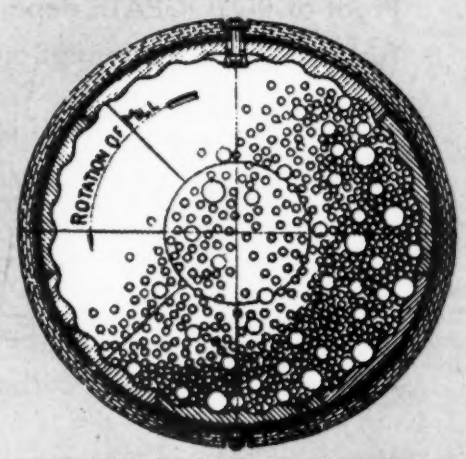
. . . . moisture in coal is absorbed by current of hot air passing through mill, making possible grinding of coal containing from 5 to 15% moisture without the use of a dryer and assuring direct firing without storage bins.

. . . . collecting fines by air and perfect mixing with air provide in effect a highly combustible gas for delivery to combustion chamber.

. . . . tramp iron and similar foreign substances cannot damage KVS Air Swept Tube Mill but instead act as grist and actually help grind coal in the same manner as the Herculite balls.

. . . . slow speed, XX Herculite liners and ball charge, along with long range availability assure exceptionally low operating costs.

. . . . a continuous, dependable supply of superfine pulverized coal is assured regardless of quality of coal available.



Cross section through center of barrel of KVS Air Swept Tube Mill and illustrating the action of the cascading balls when pulverizing coal.

Call on KVS for engineering service to help you meet your steam generating requirements.

KENNEDY-VAN SAUN · QUALITY · SERVICE · Kennedy Products · NEW YORK USA · MFG. & ENG. CORP.

Kennedy-Van Saun

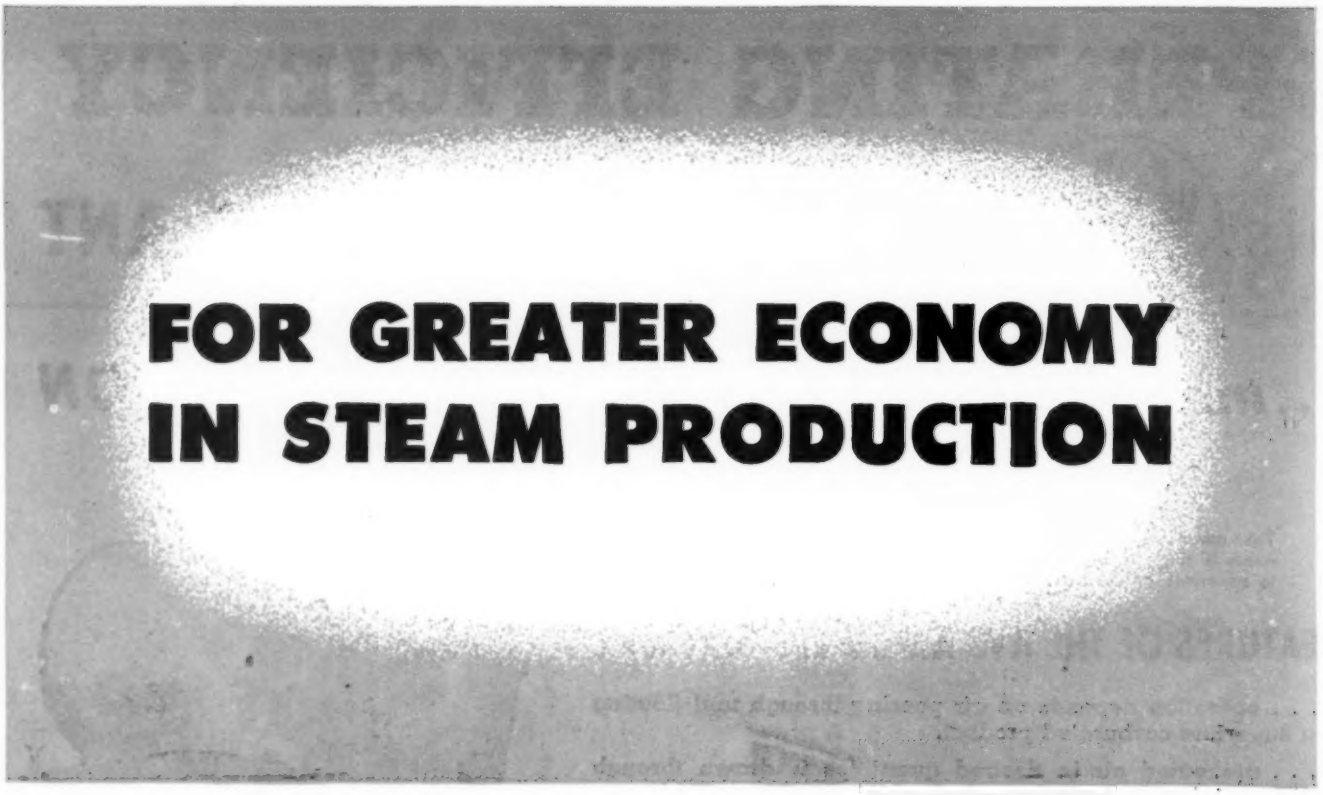
MANUFACTURING AND ENGINEERING CORPORATION

ARMY E NAVY

2 PARK AVENUE • NEW YORK 16, N. Y.

FACTORIES: DANVILLE, PA.

CANADA • ENGLAND • FRANCE • AUSTRALIA



FOR GREATER ECONOMY IN STEAM PRODUCTION

. . . more and more of the country's large Power Users and Utility Plants each year, are turning to the DETROIT ROTOGRATE STOKER.

Proof of ROTOGRATE dependability and efficiency lies in the complete satisfaction and in the repeat orders of many long-time Users.

The ROTOGRATE successfully burns a wide range of fuels without special preliminary processing of the coal.

The ROTOGRATE quickly responds to widely fluctuating loads, maintaining high efficiency.

Ash is unusually low in carbon and clinkers are negligible.

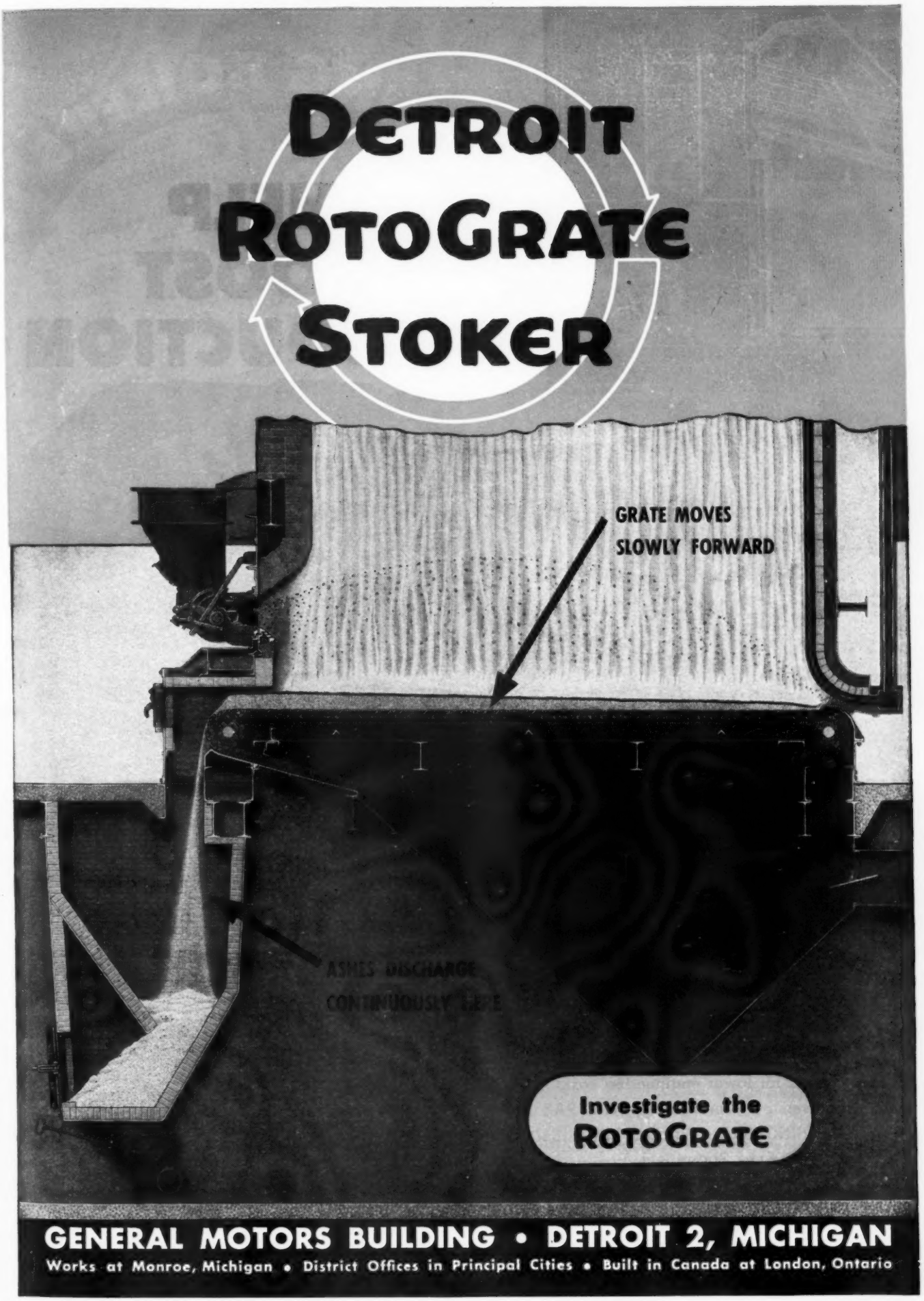
Maintenance and power costs are unusually low.

INVESTIGATE THE ROTOGRATE in the interest of economy and better performance.

Our engineers will gladly explain its many advantages, without obligation.

DETROIT STOKER COMPANY

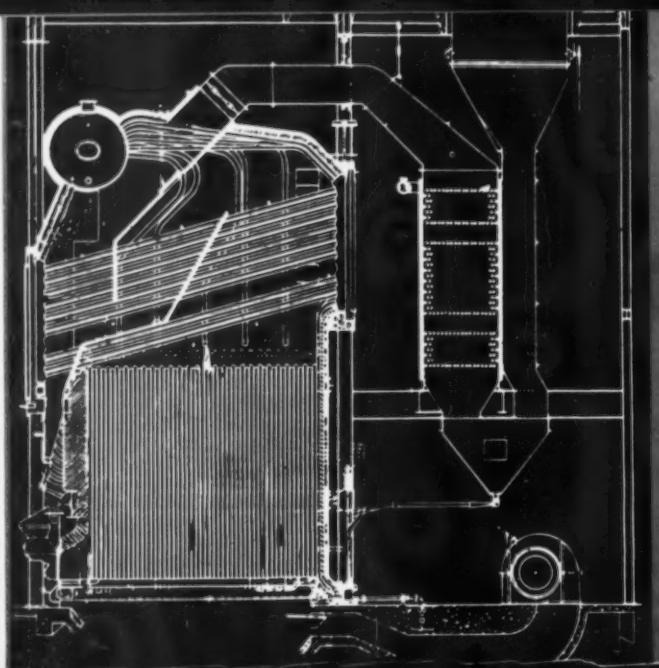
DETROIT ROTOGRATE STOKER



Investigate the ROTOGRATE

GENERAL MOTORS BUILDING • DETROIT 2, MICHIGAN

Works at Monroe, Michigan • District Offices in Principal Cities • Built in Canada at London, Ontario



• *SPRINGFIELD DESIGNS vary in size . . . shape . . . and details, depending on individual requirements. The unit shown in exposed section here is a typical design used with spreader stoker firing. Variations in this design are used with other types of stokers . . . pulverized coal . . . oil . . . or gas firing.*

BUILDING BOILERS THAT HELP BOOST PRODUCTION

A Single Aim--

• Springfield Boiler Company is devoting its attention exclusively to the production of modern, high efficiency boilers and their associated parts. This singleness of purpose and specialization is your assurance that your job will get attention second to none when placed in Springfield's hands. Springfield engineering and shop facilities are available for producing boilers to exactly meet your special requirements. At the same time, worthwhile opportunities exist to take advantage of a duplicate of one of Springfield's numerous, modern installations for lower engineering costs . . . quicker delivery . . . proven performance. IT WILL PAY YOU TO CHECK WITH SPRINGFIELD. Write SPRINGFIELD BOILER CO., 1953 E. Capitol Ave., Springfield, Ill.

QUICK FACTS

- **LESS OUTAGE TIME. HIGHER AVERAGE AVAILABILITY.** No need to wait for settings to cool to inspect tubes. No climbing into drums. Quick access to tubes.
- **PLENTY OF OVERLOAD CAPACITY.** Users push rugged Springfield units to high ratings without danger . . . without material loss of efficiency . . . without setting up carry-over difficulties.
- **QUICK RESPONSE TO LOAD INCREASES.** Thanks to small tubes, staggered tube arrangement, across-tube baffling.
- **FREEDOM FROM OPERATING DIFFICULTIES.** Electric cast steel headers — no pitting, corrosion, caustic embrittlement. Welded, x-rayed, stress-relieved drums. Water-cooled furnaces, water-cooled baffles.

SPRINGFIELD

STEAM GENERATING UNITS
ANY SIZE — ANY FUEL — ANY PRESSURE

SPRINGFIELD BOILERS

what's YOUR fastening problem

HOW CAN I PREVENT NUTS FROM FREEZING TO STEEL STUDS ON HOT EXHAUST LINES OF DIESELS?

—asks a chief engineer

WHAT'S THE RIGHT METAL FOR BOLTS THAT WILL STAND 700° F. WITHOUT LOSING STRENGTH?

—asks a furnace manufacturer

CAN WE GET BOLTS THAT WON'T POP OFF THEIR HEADS DUE TO SEASON-CRACKING?

—asks a manufacturer of outdoor switching equipment

HOW CAN WE GET FASTENINGS THAT RESIST ACID AND CAUSTIC?

—asks a manufacturer of chemical equipment

TO MATCH OUR TRIM, WE NEED SILVERY-WHITE SCREWS. WHAT METAL WON'T RUST, TARNISH OR LOSE ITS FINISH?

—asks a display cabinet manufacturer

ARE THERE BOLTS THAT WILL GIVE ME THE STRENGTH OF STEEL PLUS SALT-WATER RESISTANCE?

—asks a boat builder

IF YOU NEED . . . bolts . . . nuts . . . screws . . . nails . . . rivets . . . cotter pins . . . washers . . .

TO RESIST . . . corrosion . . . rust . . . heat . . . impact . . .

YOUR BEST BET probably is use of Monel fastenings.

Specify Monel fastenings
Reg. U.S. Pat. Off.

—for security

MONEL is stronger than structural steel . . . never rusts . . . resists corrosion by all natural elements and most chemicals (*including acids*) . . . stands impact . . . is ductile enough to absorb considerable overstressing. Monel fastenings are available in *all* standard types and sizes, or can be made to order for special jobs. ***Answer your next fastening problem with Monel*** and get longer service . . . less maintenance . . . smoother operation.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall St., New York 5, N. Y.

GENTLEMEN: Please send me a copy of *Engineering Properties of Monel Bolts*, plus the address of my nearest source of supply.

Name.....

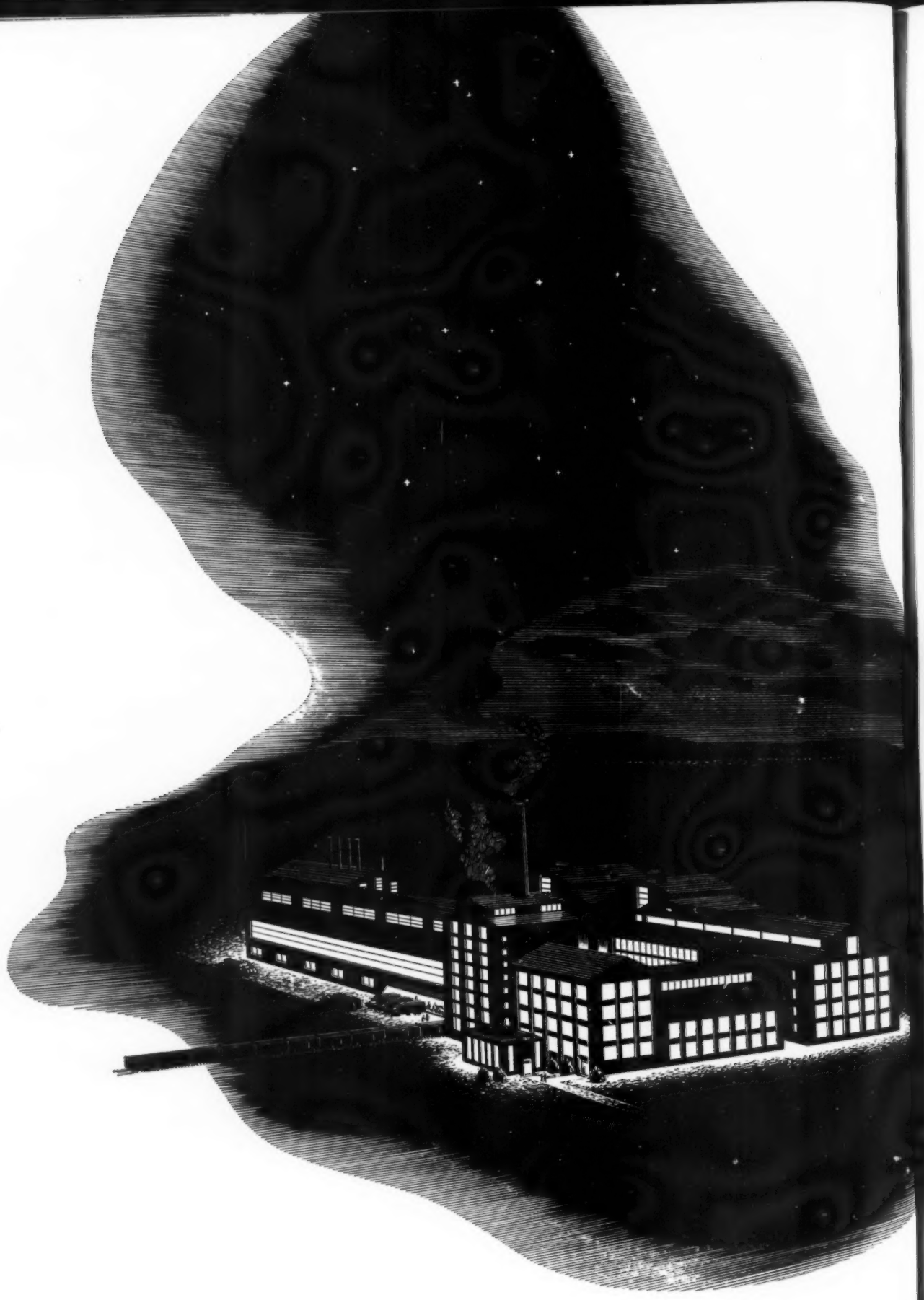
Position.....

Company.....

Address.....

.....

P-6-46



HALL SYSTEM *of Boiler Water Conditioni*

The Situation

MAKE-UP DEMAND——37,000 GALLONS PER HOUR

CAPACITY OF FEEDWATER TREATING PLANT——24,000 GALLONS PER HOUR

The Problem

TO AVERT POSSIBLE SHUTDOWN WHILE CONTINUING TO OPERATE AT EXTREMELY HIGH OVERLOAD.

For various reasons, it was necessary for this Indiana plant to carry a very high overload for a period of several weeks. Average hourly make-up requirement during this period was 31,000 gallons per hour; peak demand 37,000 gallons per hour. Yet the softener capacity was only 24,000 gallons per hour, and the filter capacity with all units in operation, only 20,000 gallons per hour. The condensate compartment of the softener could not handle all returns; it flooded over into the reaction chamber, thus adding to the difficulties of softener operation and chemical control.

Naturally there was trouble. There was a tremendous amount of suspended matter in the softener effluent; filters were not only inadequate, but their condition was none too good, and hardness of the filter effluent was much higher than normal. Phosphate consumption was excessive and despite maximum blowdown, boiler water was highly alkaline and the boilers were carrying over.

The task of the Hall engineer was to devise ways of correcting these conditions, at least temporarily, while permitting the plant to continue uninterrupted operation.

These measures were taken:

1. All boilers were blown as heavily as possible throughout the entire 24 hours of each day.

2. Phosphate feed was tripled, since tests had shown no phosphate reserve in any unit.

3. Installation of two new filters, secured earlier in the year, was rushed, so as to bring filter capacity up to softener capacity.

4. The condensate compartment was partially bypassed, by means of a line direct to feed pump suction, thus reducing the overload enough to prevent flooding of the reaction chamber.

The Hall engineer spent seven hectic days on this job—but the plant was kept in full operation. The period of heavy overload ended with no boiler outage. Additional changes were then started, designed to prevent trouble if there should again be a period of such excessive overload.

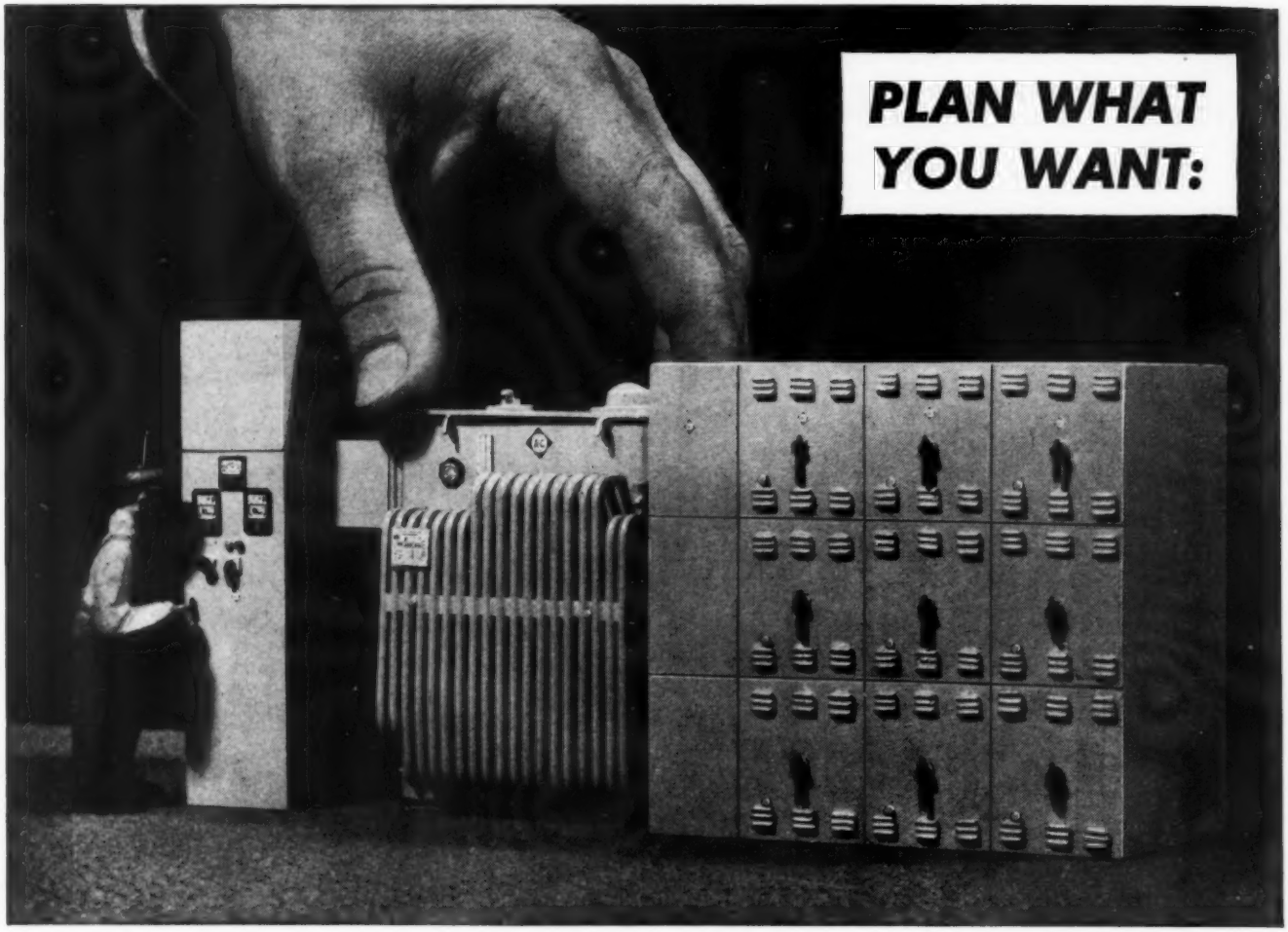
Hall service engineers are proud of their ability to meet emergencies like this—but they are still more proud of the fact that the great majority of Hall-serviced plants operate day after day and year after year *without* any serious boiler water difficulties.

Every plant that generates its own steam can profitably use Hall service. We will be glad to send you full information.

HALL LABORATORIES, INC., HAGAN BUILDING, PITTSBURGH 30, PA.

(*A subsidiary of Hagan Corporation*)

HAGAN
HALL
UROMIN
CALGON



Buy From Sight,

☛ PRE-TEST YOUR UNIT SUB IDEAS! ☛ AVOID COSTLY ERRORS! ☛ REDUCE PLANNING TIME! — YOU CAN WHEN YOU USE ALLIS-CHALMERS' "UNIT SUB BUILDER" SET TO HELP SOLVE YOUR POWER DISTRIBUTION PROBLEMS QUICKLY, SIMPLY, ACCURATELY! YOU SEE WHAT'S AVAILABLE, HOW THE RIGHT UNIT SUB WILL LOOK IN YOUR OWN PLANT.

GUESSWORK GOES when you call on Allis-Chalmers' "Unit Sub Builder" Set to help you select the right prefabricated load center unit substation for your plant.

You protect yourself against costly power distribution mistakes when you *pre-test* your ideas with Allis-Chalmers models . . . because you *see* just what you're getting in terms of dimensions, characteristics, appearance.

In addition, visual planning is quick, easy, accurate. You build the answers to your unit sub problems *right on the top of your desk.* At a glance you see equipment that's available, the various ways it can go together, how the *right* unit substation will look when installed in your own plant.

and Buy Right!

—with

ALLIS-CHALMERS

Unit Sub Builder Set

An even clearer picture will result if the models of Allis-Chalmers unit substation equipment are built up on a floor plan of your plant drawn to the same scale.

Leading Firms Use Service

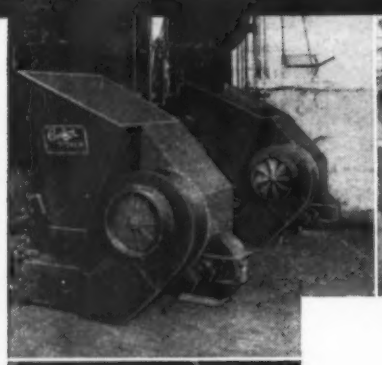
In the comparatively short period Allis-Chalmers' "Unit Sub Builder" Set has been available for assisting power distribution planners, engineers of many leading U. S. firms have taken advantage of its time-saving, trouble-saving benefits. They like the idea of working out solutions . . . without bogging down in complicated charts and catalogues.

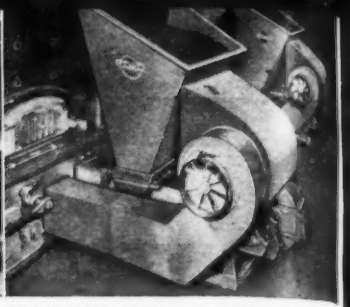
This complete *and proven* service is yours with no obligation. To see for yourself how the "Unit Sub Builder" Set can help you in the planning of your power distribution system, call your nearby Allis-Chalmers district office.

An A-C field engineer will bring the models, together with a handy "Unit Sub Slide Rule" for calculating breaker capacities — and a "Check List" to give you the added planning safety of a *double check*. ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WISCONSIN.

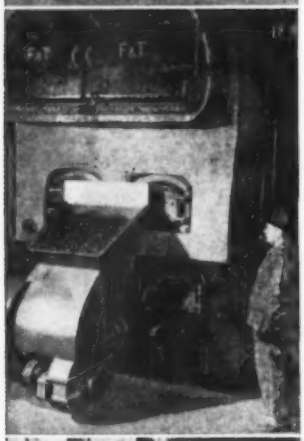
A 1951

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*





COPPERWELD STEEL CORP., WARREN, OHIO ISALY DAIRY, NEW WILMINGTON, PA. EUCLID ROAD MACHINERY CORP., CLEVELAND



U. S. NAVAL AIR FACILITIES, COLUMBUS, O

MORIN HEIGHTS HOUSING PROJECT, WOONSOCKET, R. I.

GRIFFIN MANUFACTURING CO., BROOKLYN, N. Y.

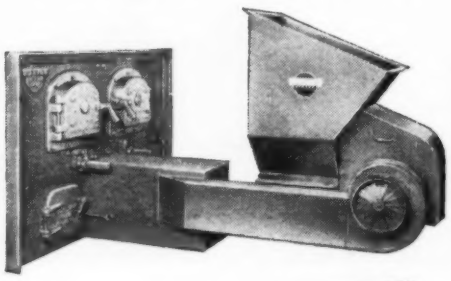
E & W DYEING CORP

THERE ARE 54 TYPES AND SIZES OF

CANTON STOKERS

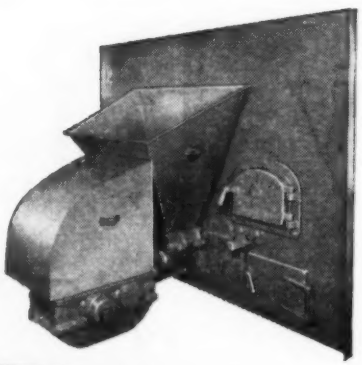
TO MEET *YOUR* REQUIREMENTS

HERE ARE THE THREE BASIC DESIGNS . . .



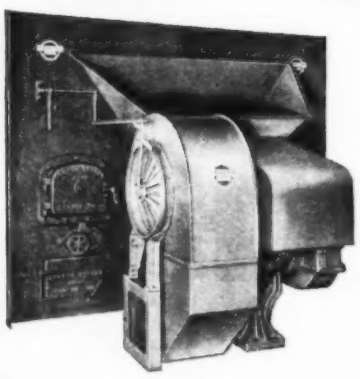
DURAFLEX

A wormfeed stoker for industrial and commercial installations with many features usually found only on ramfeed designs. Especially adapted to boilers developing up to 175 H.P., the Duraflex includes the refinements of a large active grate area, side ash dumping plates and zoned windbox. Separate fan drives and full furnace fronts are standard auxiliaries always available. Write for Bulletin No. 500.



LO-SET

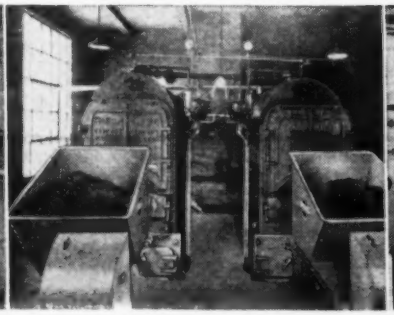
A compactly designed Heavy Duty Ramfeed stoker that has saved expensive furnace alterations and pitting for installation on scores of jobs. Built with a safety factor of 5 to 1 for developed loads of 450 H.P., the LO-SET will easily carry over-ratings up to 200%. Hi-Firebox heating and power boilers, designed to avoid furnace refractory, are successfully fitted with Canton Lo-Set Stokers. With Canton Synchronized Combustion Control, this unit will swing from 50% to 200% of boiler rating without manual attention. Request Bulletin No. 400.

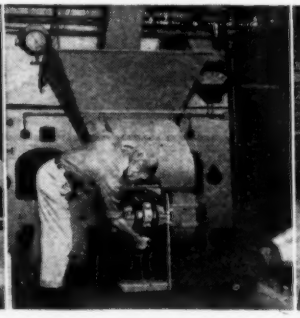


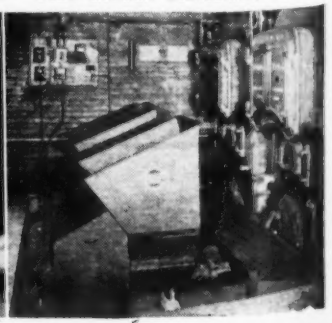
VULCAN

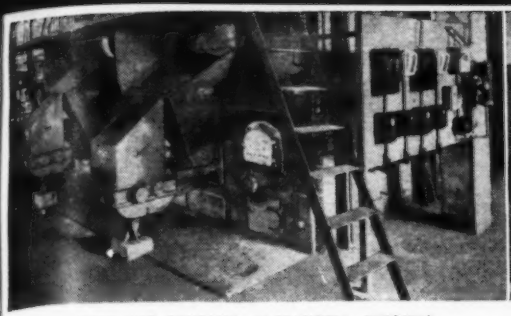
All Custom Built, these Stokers carry the heaviest industrial loads in continuous duty service. On either electric or steam drives they develop 800 H.P. or more, and with Canton Synchronized Combustion Control require no manual attention in shifting from 50% to 200% of rating. An extremely rugged, dust-proof gear box drives the Stoker through oversize bearings, gears, and sprockets with a safety factor of 5 to 1. Wearing surfaces are alloy-hardened and many parts are practically indestructible. Full information is offered in Bulletin No. 200.

PATERSON, N. J FERRO-ENAMEL CORP., CLEVELAND PAGE LAUNDRY, WASHINGTON, D. C. GESU CHURCH, CLEVELAND, OHIO

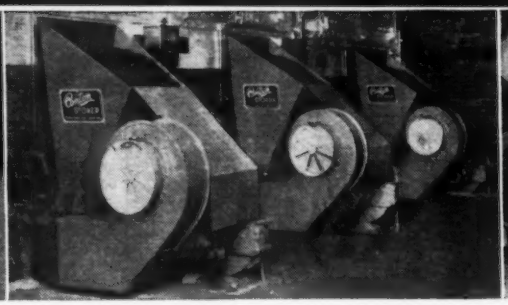






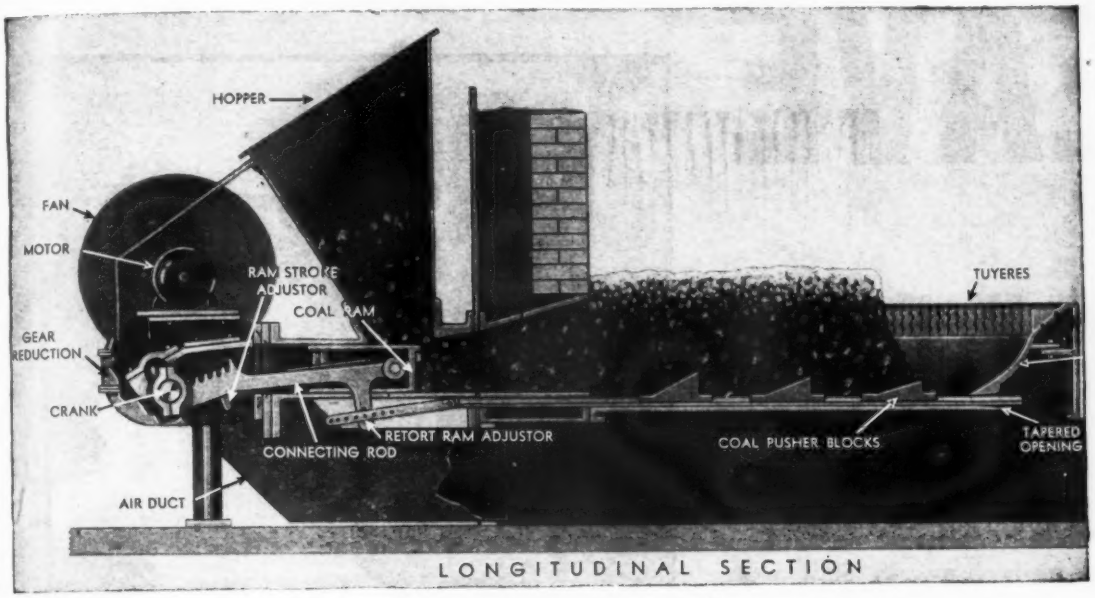


NORTON AND COMPANY, ALEXANDRIA, VIRGINIA



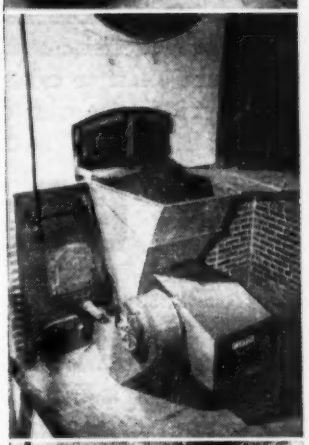
GENERAL HOSIERY COMPANY, FT. WAYNE, IND

GROVE PARK INN ASHEVILLE, N. C.

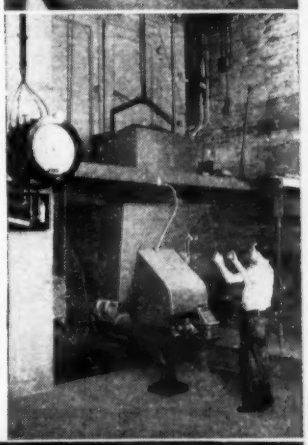


LONGITUDINAL SECTION

NEWBURGH AND SOUTH SHORE RAILWAY



VICTOR SILK HOSIERY, NEW BRITAIN, PENNA.



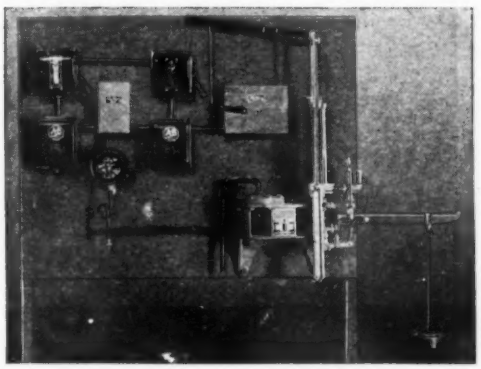
SHOREHAM HOTEL, WASHINGTON, D. C.

THIS X-RAY VIEW OF THE CANTON VULCAN STOKER *gives the inside facts on the simplified, powerful mechanism. Coal is loaded into V-shaped Hopper by hand or conveyor system, and falls by gravity down to Coal Ram. The Coal Ram is driven in a reciprocating action by the Crank, allowing coal to fall in front of Coal Ram on back stroke, and pushing it into Furnace on forward stroke. The highly efficient mounting of motor and gears delivers maximum power to the Coal Ram, which easily crushes wood, slate, and small pieces of foreign matter, feeds them into Furnace, and thus eliminates usual causes for stoppage. After passing through Throat, coal is distributed and levelled over the entire area of the Furnace by a Retort Ram with Pusher Blocks, adjustable for any kind or size of coal.*

CANTON STOKERS SAY IT WITH SERVICE—AND BACK IT UP WITH A FIVE YEAR GUARANTEE

CANTON STOKERS

Synchronized Combustion Controls-- For automatically varying coal feed, forced draft and boiler draft to follow efficiently steam demand.



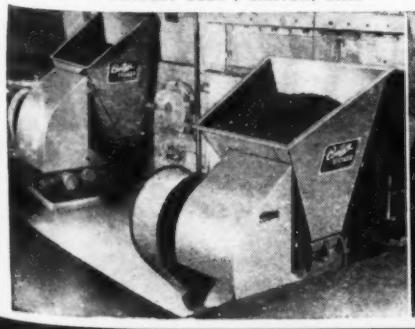
All working parts not exposed to the fire are covered by a five year guarantee applying not only to defects, but actually wear itself. Only because these Stokers are built stronger at vital points, from superior materials, do they merit such a guarantee. A corps of travelling service engineers assists and advises Canton Stoker owners in securing best results.

Now **IMMEDIATE DELIVERY FROM STOCK**

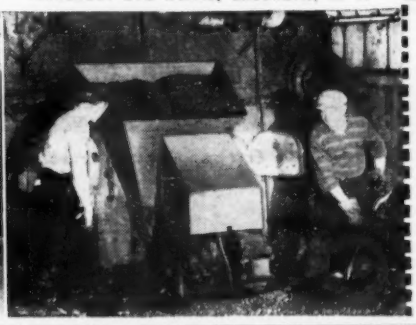
TO REPLACE OIL, GAS, OR HAND FIRING EQUIPMENT

Send for Descriptive Literature and Cost Saving Facts

11 STORY RENKERT BLDG., CANTON, OHIO



HUMBOLDT DYE WORKS, BROOKLYN, N. Y.



CANTON STOKER CORPORATION

741 ANDREW PLACE, S. W., CANTON, OHIO

Gentlemen:

---Please send all descriptive literature at once

---Have a CANTON Engineer interview us immediately

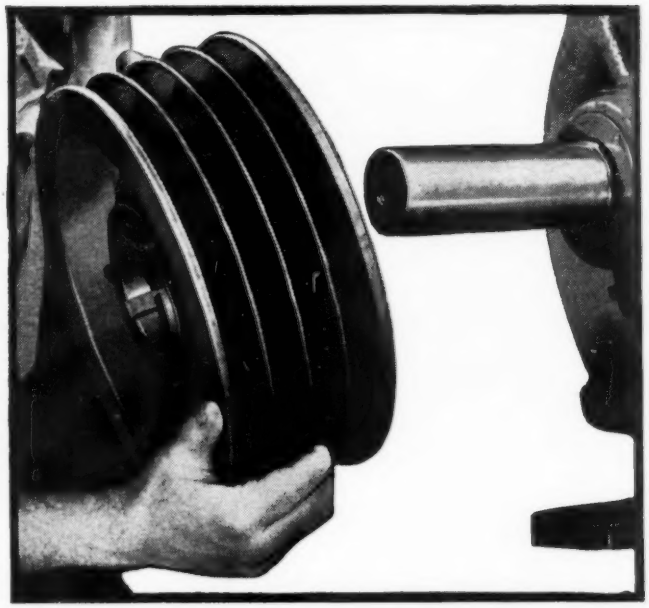
Name ----------

Company ----------

Address ----------

City---------- State----------

"MAGIC-GRIP" SHEAVE



GOES ON EASY

There's plenty of clearance in the bushing of the patented "Magic-Grip" sheave. It slips easily on even oversize shafts . . . never requires filing, reaming or hammering. Think of the time and money *that* can save!

Sheave and bushing come completely assembled... one precision-made unit ready to mount. Slide it on the shaft to exact alignment. Then — tighten three cap screws with the handy wrench furnished. That's all! Any one can do the job—quickly, easily, accurately.

—GRIPS TIGHT

The sheave is locked on the shaft with the powerful grip of a vise. No slip, no backlash or wobble. Yet it can be removed as easily as it goes on.

"Magic-Grip" sheaves save time and money the first time they are installed . . . are indispensable for applications requiring frequent sheave changes. Yet they cost no more than standard sheaves of comparable heavy-duty construction.

YOUR V-BELT DRIVE HEADQUARTERS

Call your nearest Allis-Chalmers office or dealer for TEXROPE "Magic-Grip" sheaves, Texsteel, Texdrive and Vari-Pitch sheaves, Speed Changers and famous TEXROPE Super-7 V-Belts. Full range of types and sizes. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 2035

ALLIS CHALMERS
TEXROPE V-BELT DRIVES

HEAR THE BOSTON "POPS": *Every Saturday Evening, American Broadcasting Co.*

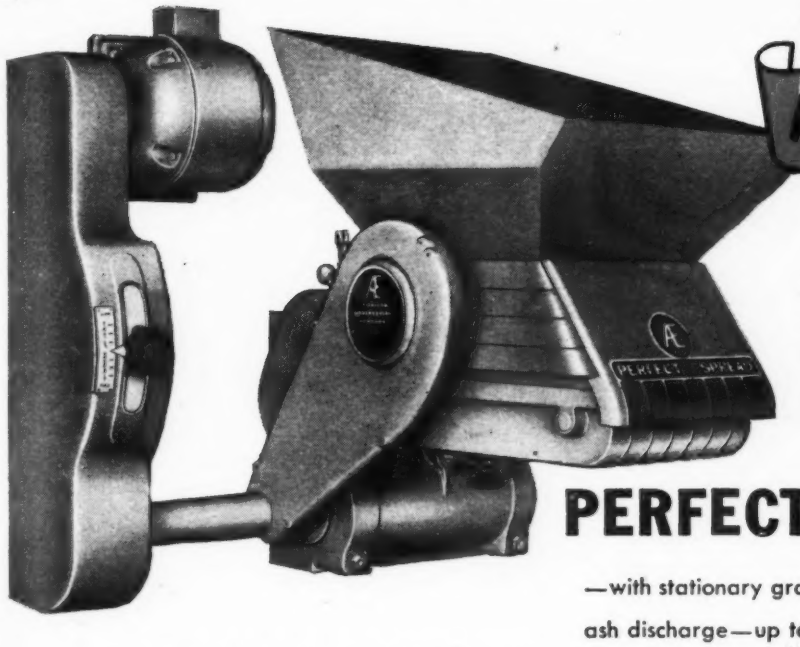
Efficient 17 *Years Ago*

BETTER THAN EVER TODAY

Accepted as cost cutting, efficient, fuel-firing equipment 17 years ago, the Perfect Spread Stoker *is still better today.*

Using the principle of operation which marks its 17 years of successful performance, it has been streamlined and improved. It combines many operating features not available in any other stoker—handles all types of coal efficiently, economically.

Fuel and maintenance savings are assured with its dependable operation. Its easy-to-clean, pleasing exterior adds modern appearance to your boiler room. Before buying fuel firing equipment investigate the Perfect Spread Stoker. Write for descriptive booklet *today!*



Won't Clog on Wet Coal!

Feed this stoker the lowest available grade of coal! Watch it operate perfectly—without clogging—on *any* grade—wet, dry, or partially frozen. This "non-clog" feature is exclusive with Perfect Spread.

Æ

PERFECT SPREAD STOKER

—with stationary grates, dumping grates or continuous ash discharge—up to 400,000 lbs. of steam per hour.

OTHER Æ PRODUCTS: Æ TAYLOR STOKERS, LO-HED HOISTS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

AMERICAN ENGINEERING COMPANY

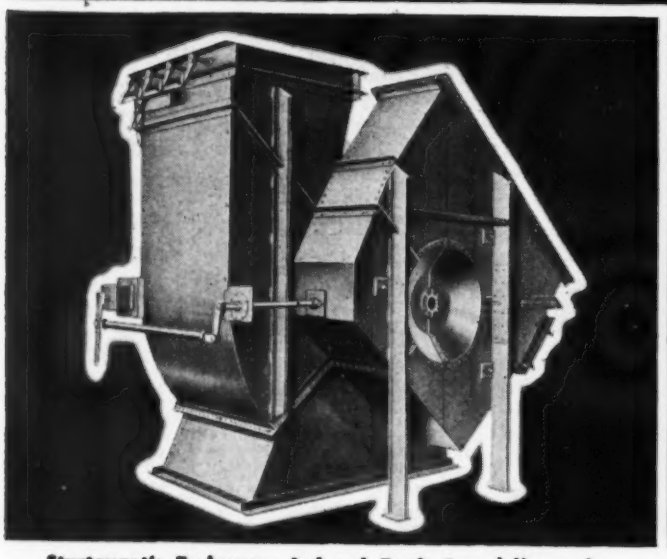
2400 ARAMINGO AVE., PHILADELPHIA 25, PENNSYLVANIA

LARGEST POWER SYSTEM EVER ASSEMBLED AS ONE UNIT — AT ONE TIME!

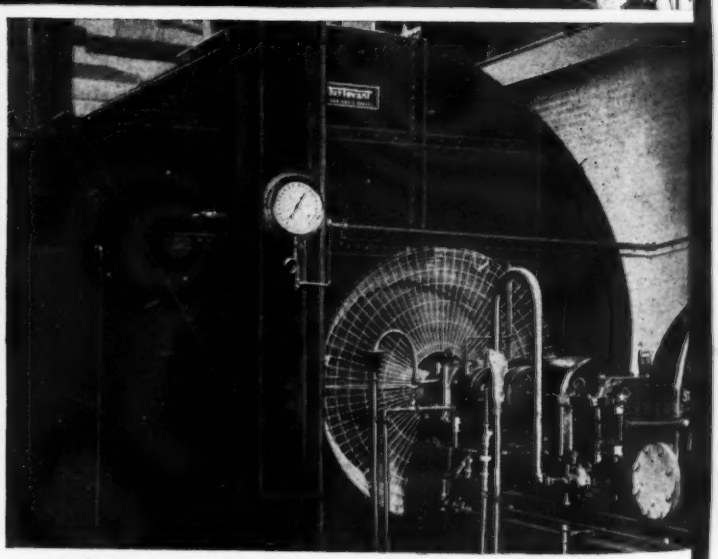
Millions of pounds of steam . . . thousands of KVA of electric power . . . that's what it takes to run the gaseous diffusion plant of "Manhattan Project" at Oak Ridge, Tennessee. And in meeting these tremendous demands, a new world's record was set. It was the *largest power system ever assembled as one unit at one time!*

Sturtevant equipment includes twelve forced and induced draft fans. Six design 9 Turbovanes, double width, double inlet, with Sturtevant's patented Vane Control* furnish the forced draft. Induced draft fans are six TVIDs, double width and inlet, also with Vane Control. The main power plant, housed in the building shown here, produces 238,000 KW of power for the 600-acre, half-billion dollar project.

*U.S. Patent Nos. 1,460,428; 1,578,843; 1,846,863; 1,989,413.



Sturtevant's Turbovane Induced Draft Fan delivers the same high efficiency that you once thought possible only in forced draft fans. Full details on request.



Turbovane Forced Draft Fan, with Sturtevant Vane Control, permits higher efficiency at any RPM and any power output. Write for further details.

HEATING • VENTILATING • AIR CONDITIONING •

DRYING • DUST AND FUME CONTROL

HOW OAK RIDGE GOT THE POWER TO MAKE THE ATOM BOMB

The story of a new world's record in setting up a power plant . . . and how Sturtevant helped make it possible

The name "Manhattan Project" meant no more to Sturtevant two years ago than to dozens of other companies who were called in to furnish the equipment. Actually, a new world's record in power plant construction was being established at Oak Ridge, Tennessee—it was *the largest power system ever assembled as one unit, at one time.* And today Sturtevant is proud of its part in making this record possible.

For Sturtevant mechanical draft fans—both forced and induced—supplied the air for the tremendous power requirements of the gaseous diffusion plant at Oak Ridge. Equipment included TURBOVANE forced and induced draft Fans (see opposite page), both of which have given distinguished service in major installations throughout the country.

At Oak Ridge, as in most of the country's large power plants, Sturtevant mechanical draft equipment has set new standards of efficiency, reliability and economy. At Ford's River Rouge . . . in utilities such as Brooklyn Edison's Hudson Station . . . and in hundreds of smaller but no less important installations . . . Sturtevant fans are in operation twenty-four hours a day, delivering peak efficiency with a minimum of upkeep.

A Sturtevant field engineer is always available to study your own particular power requirements. Inquiries should be addressed to the nearest Sturtevant branch office or B. F. Sturtevant Co., *Division of Westinghouse Electric,* Hyde Park, Boston 36, Mass.

3624-60

Sturtevant
REG. U.S. PAT. OFF.
Puts Air to Work

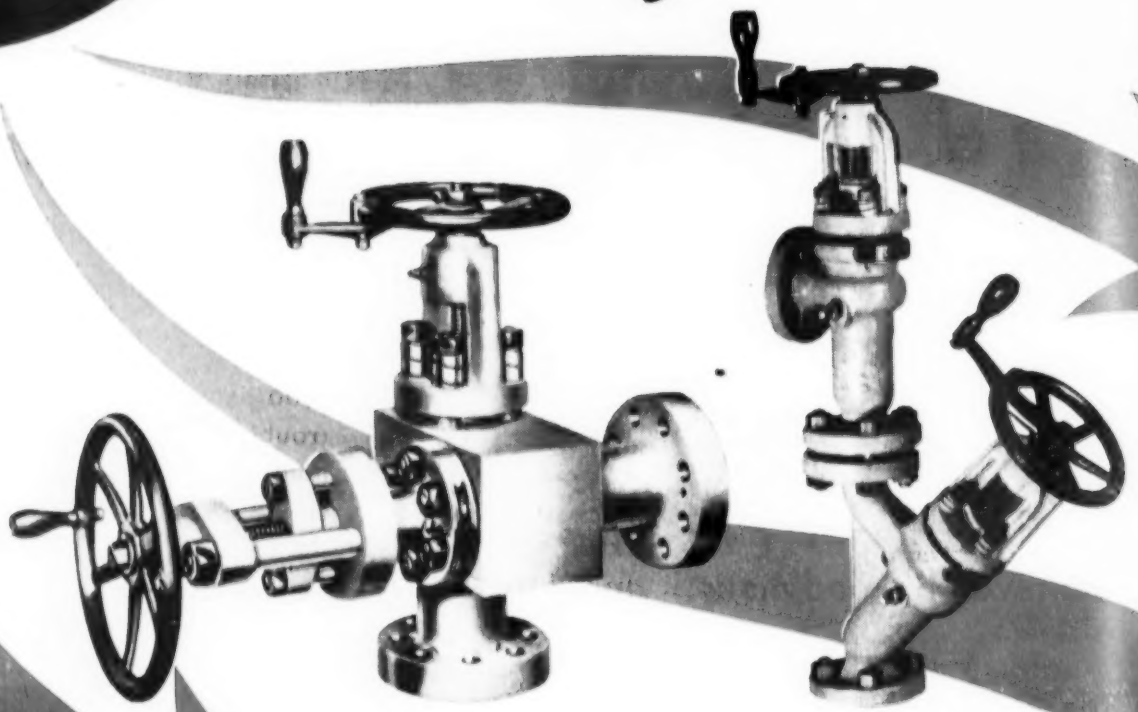
Sturtevant has always been known as Industry's No. 1 source for mechanical draft equipment. And now, as a division of Westinghouse Electric, Sturtevant is the *only* source that offers you these three important advantages:

1. **UNDIVIDED RESPONSIBILITY** for the complete system—fans, motors, controls, fly-ash disposal systems.
2. **IMPARTIAL ENGINEERING HELP** because between them, Sturtevant and Westinghouse make all types and sizes of air handling equipment, including all accessories.
3. **COST SAVINGS** that come from buying the complete system in one "package." No extras, no added costs.

B. F. STURTEVANT COMPANY • DIVISION OF
Westinghouse ELECTRIC

PRECIPITRON
MECHANICAL DRAFT

3 Ways to



Yarway Unit Tandem Blow-Off Valve

Yarway Seatless Tandem Blow-Off Valve

Yarway Remote Liquid Level Indicator

YARWAY REMOTE LIQUID LEVEL INDICATOR

It's instant! It's accurate! It's convenient! This new Yarway Remote Liquid Level Indicator brings overhead gage readings right down to eye level on the instrument panel or other desirable location, on a brilliant red and green scale.

New degrees of accuracy are possible because the indicator is operated by the boiler water itself . . . by the pressure differential between a constant head of water and the varying head in the boiler drum. Action is instant, constant, frictionless. *There are no stuffing boxes.*

Already nearly 3,000 are in service. Write for Bulletin WG-1821.

YARWAY

GOOD BOILER ENGINEERING

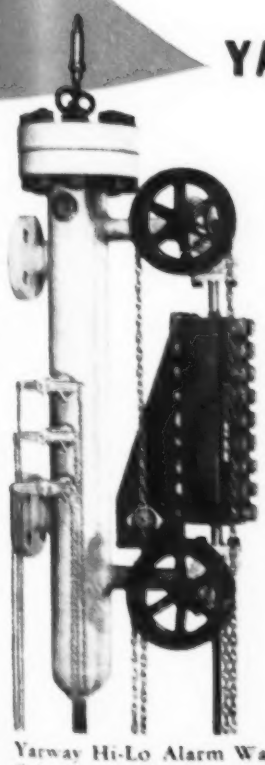
YARWAY BLOW-OFF VALVES

These are the blow-off valves that are standard in over 12,000 plants today. Yarway's famous *seatless* design eliminates one of the commonest sources of trouble and expense in boiler blow-down service. There is no seat to score, wear and clog with mud, dirt and scale. For pressures up to 2500 psi, Yarway's finest blow-off valve, the Unit Tandem, combines in a single forged-steel body a Hard-Seat* blowing valve (next to boiler) and a Seatless sealing valve.

Write for Bulletin B-424 (to 400 psi), or Bulletin B-432 for higher pressures.

**Seats furnished either separate or integral.*

YARWAY WATER COLUMNS AND GAGES



Yarway Hi-Lo Alarm Water Column with Flat Glass Gage

Yarway Hi-Lo Alarm Water Column with Sesure Inclined Gage

Leading utilities, industrial plants and institutions rely on Yarway Floatless Hi-Lo Alarm Water Columns to give instant warning of any dangerous deviations in boiler water level. Alarm mechanism employs *solid weights* which operate on the displacement principle . . . can never become waterlogged. Column is furnished with Vertical or Sesure Inclined Round Glass gage for low and medium pressures . . . . or with welded Vertical Mica-protected Flat Glass gage for higher pressures.

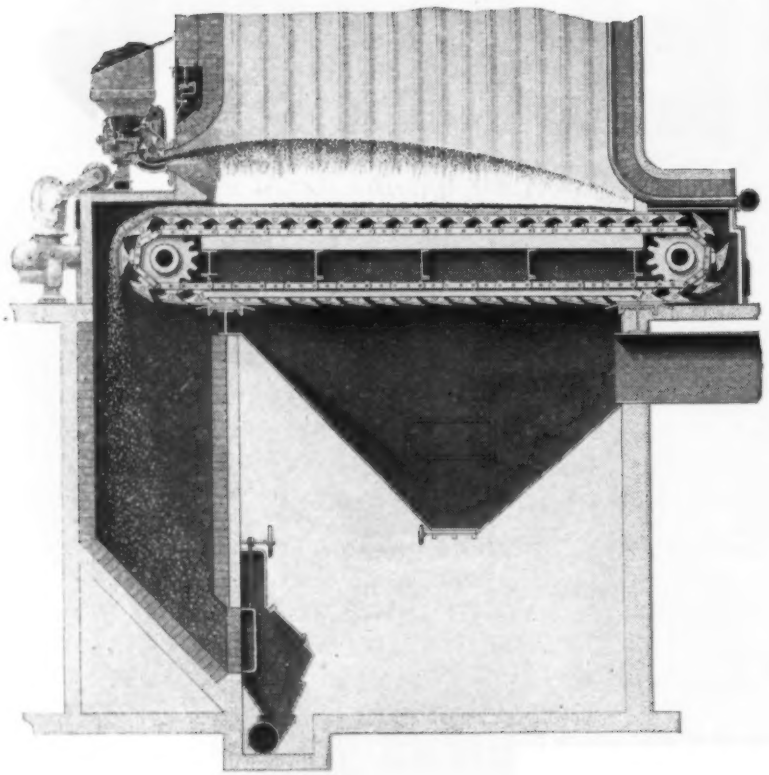
Yarway Water Columns and Gages are fully described in Bulletin WG-1810.

YARNALL-WARING COMPANY
100 Mermaid Avenue Philadelphia 18, Pa.

STEAM PLANT EQUIPMENT

HOFFMAN

AS EXEMPLIFIED BY THE C.A.D. GRATES

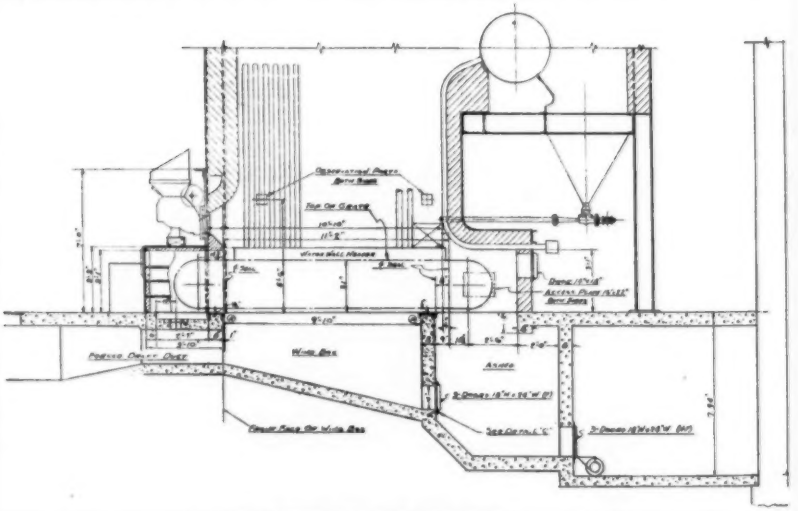


Continuous ash discharge spreader stokers are receiving constantly increasing attention in modern plant design, due to the wider use of high ash coals, for both domestic and foreign markets.

While at the present time delivery dates seem of paramount importance, nevertheless the discerning buyer will look carefully into the engineering features that contribute to high efficiency and low maintenance through the years.

Hoffman stokers backed by a quarter of a century

Firite SPREADER TYPE



A 45,000# unit for Municipal Power Plant

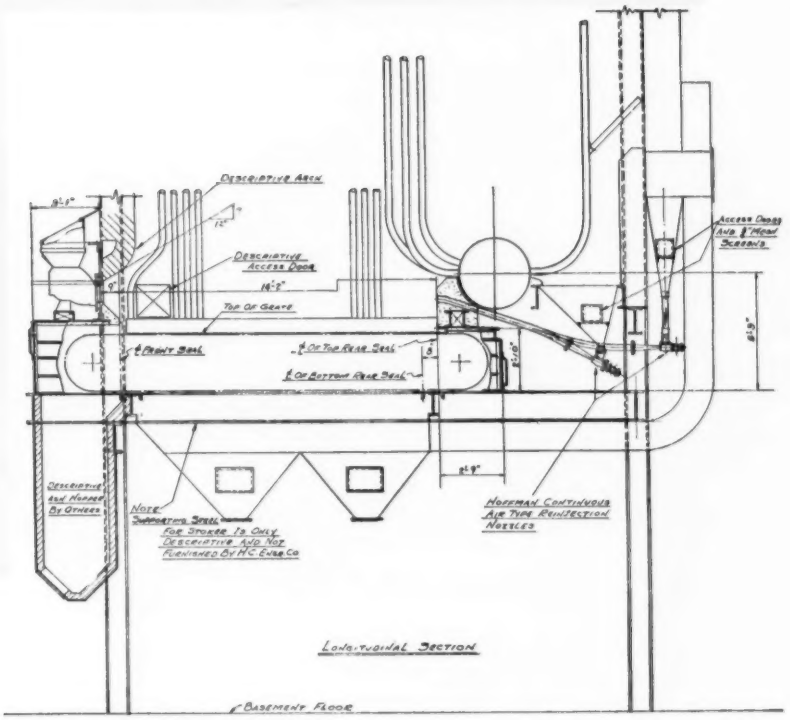
HOFFMAN COMBUSTION

WORKS AT: FAIRMONT, WEST VIRGINIA
DETROIT, MICHIGAN

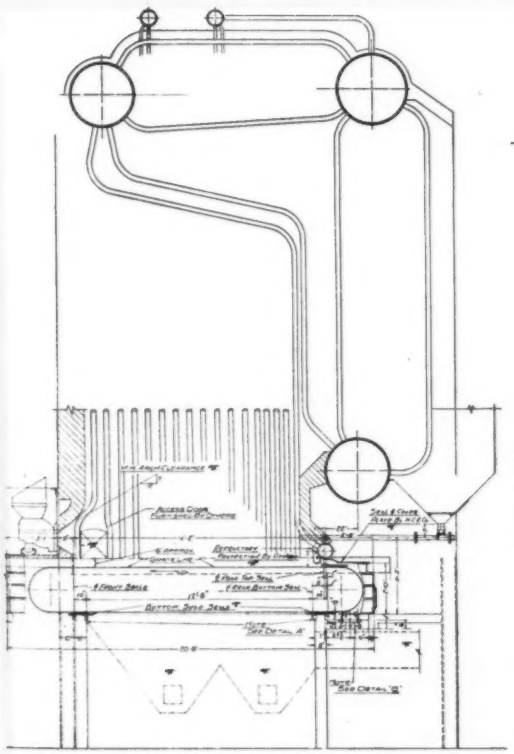
STOKER *Leadership*

of specialized experience in spreader stoker engineering lead both domestic and foreign markets.

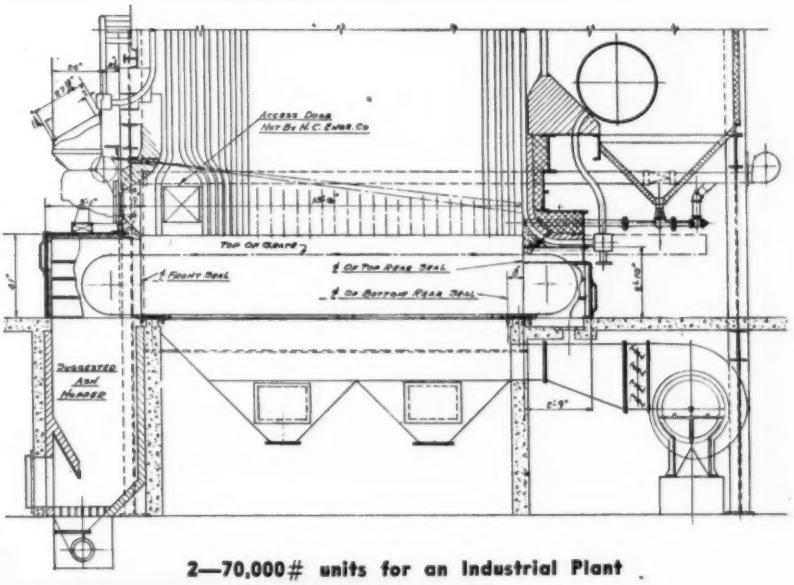
By limiting commitments for export and conserving production capacity, Hoffman has been able to meet the requirements of an extensive repeat business from a distinguished domestic clientele.



3 90,000# units for a Public Utility Plant



A 75,000# unit for An Industrial Plant

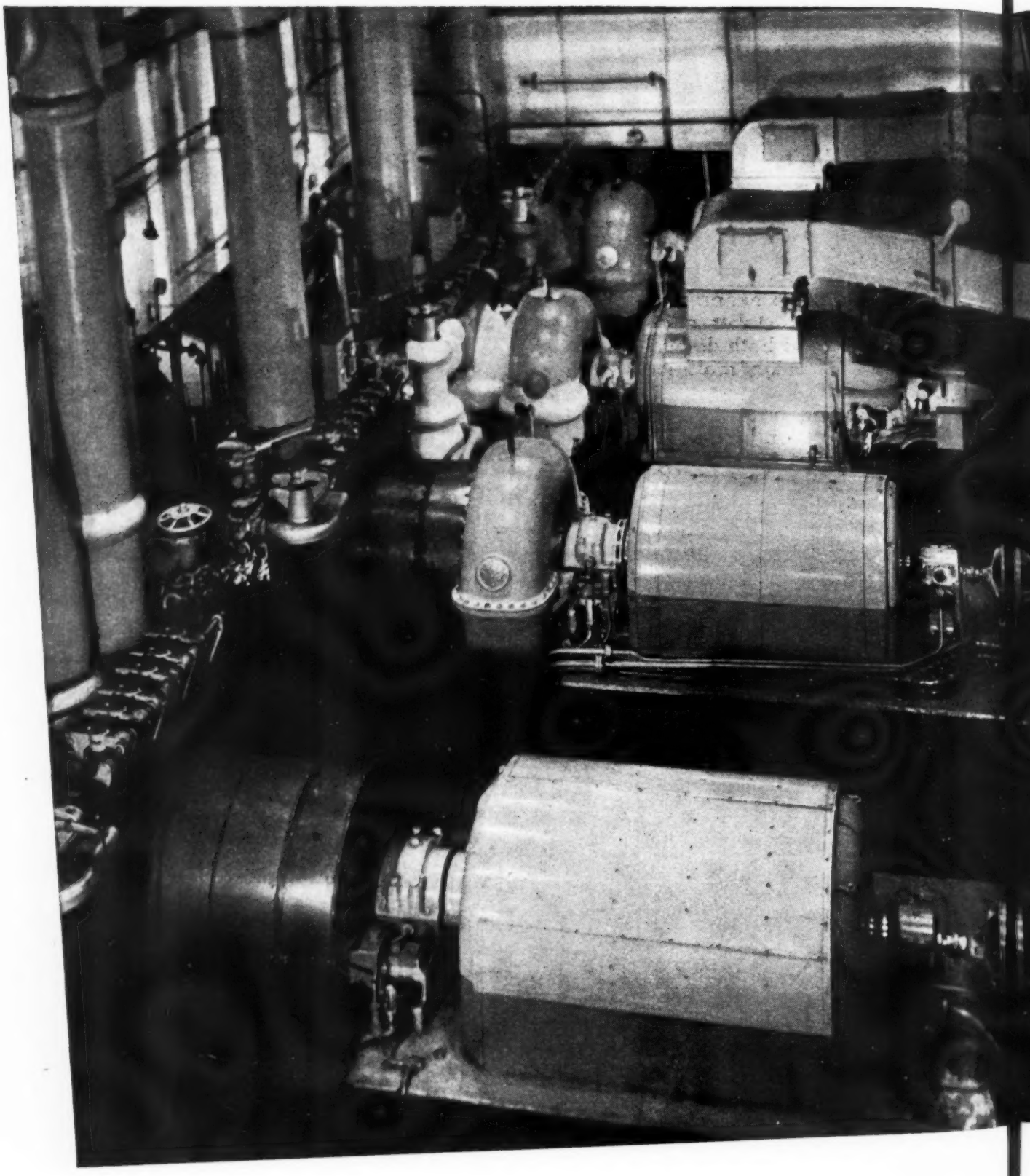


2—70,000# units for an Industrial Plant

ENGINEERING COMPANY

OFFICES: Marquette Building, Detroit, Mich. Bell Building, Chicago, Illinois
154 Nassau Street, New York City Twenty-Two Marietta Bldg., Atlanta, Ga.

Agents in industrial centers



TUNE IN
THE TEXACO STAR
THEATRE EVERY SUNDAY
NIGHT STARRING
JAMES MELTON
WITH HIS GUEST,
ED WYNN — CBS

TEXACO

TEXACO

Your Turbines... GET Extra Protection GIVE Extra Performance

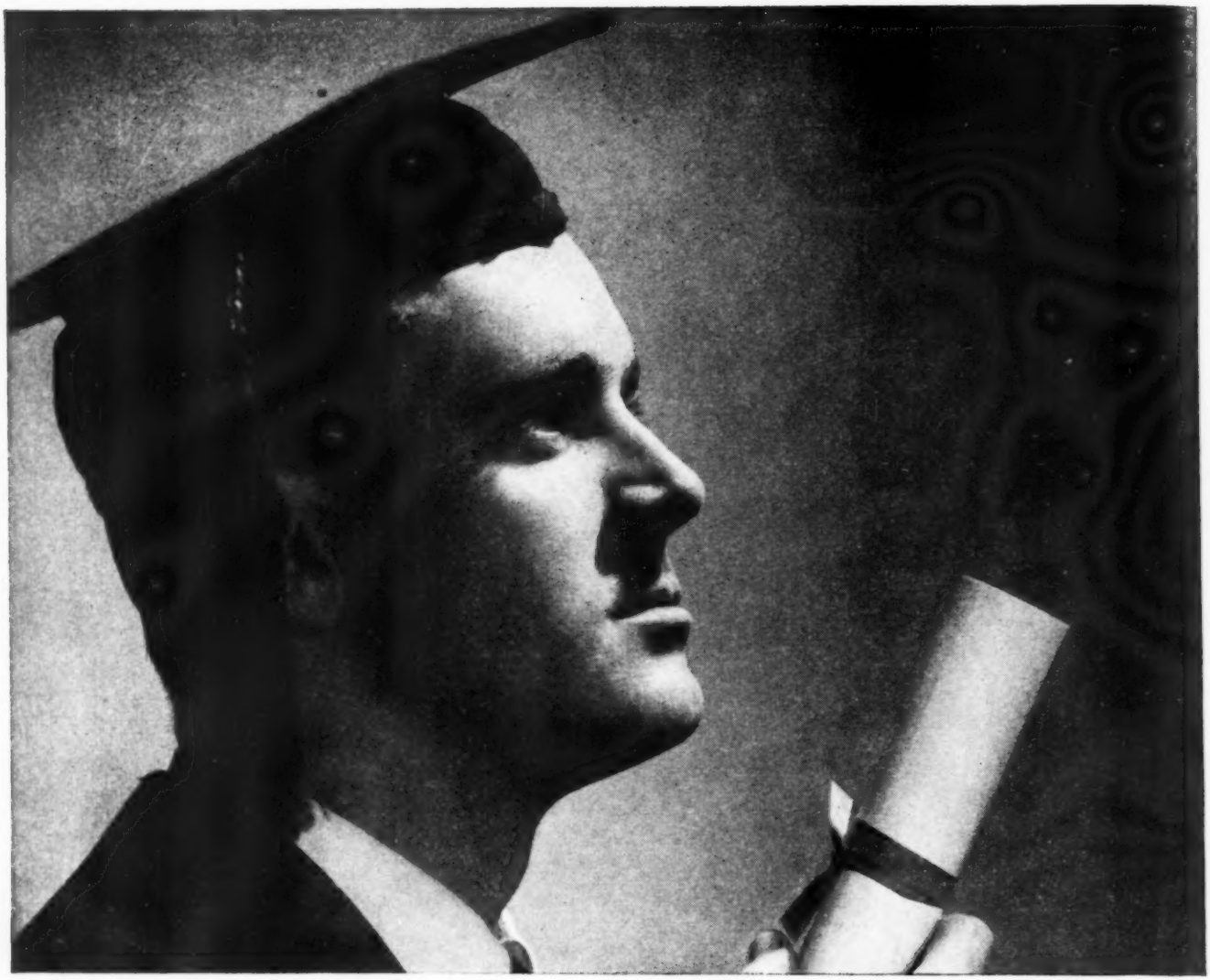
TURBINES lubricated with *Texaco Regal Oils (R & O)* get *extra* protection . . . because these are the world-famous *Texaco Regal Oils improved* to assure the highest possible resistance to oxidation and rust, sludge and foam. Consequently—

Texaco Regal Oils (R & O) keep turbine lubricating systems *clean* . . . assuring the unfailing flow of oil necessary to maintain normal bearing temperatures and smooth, sensitive governor action. Their use means extra efficient, trouble-free performance, reduced maintenance costs, and longer turbine life.

Texaco Regal Oils (R & O) fully meet specifications of all leading turbine builders, and the turbine oil specifications of the U. S. Navy.

For Texaco Products and Lubrication Engineering Service, call the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

REGAL OILS (R & O)
FOR ALL TURBINES



ONLY THE BEGINNING...

Successful completion of his academic career marks only the beginning of an S-A engineer's education. Still to come is the practical knowledge—the "horse sense," if you will—that isn't found in text books.

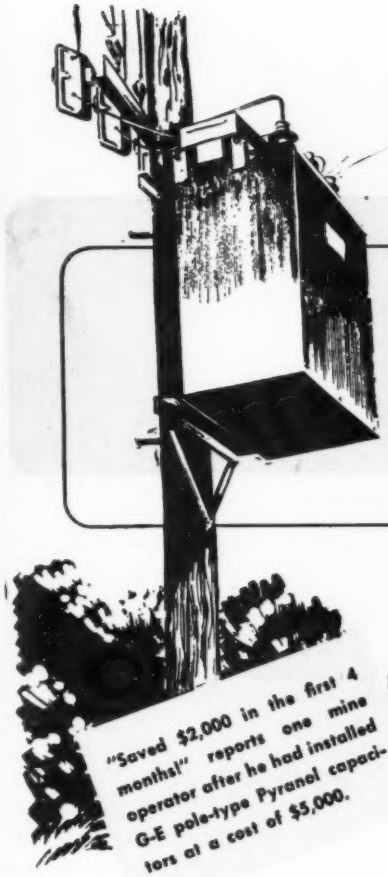
When you work with an S-A bulk material handling engineer, you work with a man who combines technical training with the broad and varied background that comes only after years of working under actual field conditions. You work with a man who has rubbed elbows with the industry's most progressive group of conveyor engineers and who has handled materials under many conditions. You work with a man who has unrestricted choice from a complete line of conveyors and accessories, designed and built by the company that for 45 years has led the field with new units and new methods. You work with a man who can help you convey the *right* volume to the *right* place, at the *lowest* cost per ton . . . over the long term.

If you want the man to whom technical training is only the beginning, talk to an S-A engineer.

STEPHEN S-A ADAMSON MFG. CO.

5 RIDGEWAY AVENUE, AURORA, ILLINOIS · LOS ANGELES, CALIF. · BELLEVILLE, ONT.

Designers and Manufacturers of All Types of
BULK MATERIAL HANDLING EQUIPMENT



"Saved $2,000 in the first 4 months!" reports one mine operator after he had installed G-E pole-type Pyranol capacitors at a cost of $5,000.

LET G-E PYRANOL CAPACITORS Boost Your Electrification Gains

Assure Top Performance, Reduced Power Costs, Through High Power Factor

The economies obtained by increased electrification of industry can be seriously affected by a low power factor and the resulting high power costs. This needn't happen in your case—if you take advantage of the savings made possible by proper capacitor utilization. If you buy power and your contract contains a power-factor adjustment or kva-demand clause, capacitors can reduce your power costs by giving you more "working" power for every dollar you spend.

If you operate your own power plant, capacitors enable your generators to deliver more "payload" kilowatts—up to their maximum rating. In either case, they improve your voltage, reduce power losses, and help prevent system overloading. Very often, too, a capacitor installation permits the addition of more motors or other electrical equipment to a "fully loaded" system without the expense of additional feeders, transformers, or generators.

Users tell us that G-E capacitors return from 57 per cent to 120 per cent of their original cost every year. In other words, they pay for themselves many times over. Reliability of operation, of course, is essential before you can realize any worthwhile savings and G-E Pyranol capacitors are noted for the care and precision used in their manufacture. They're non-inflammable, hence less expensive to install. They are smaller than other types, require less space, and they have stable operating characteristics that assure long life.

Applying capacitors to secure maximum savings requires a study of your existing and anticipated circuits and power demands. General Electric engineers, because of their wide experience in this field, are able to render this service. Why not consult with the G-E office nearest you? *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

ENCLOSED CAPACITOR UNITS for single motors or small loads. Ratings from 0.5 to 7.5 kvar, 230 volts; 1 to 15 kvar, 460 and 575 volts for 1-, 2-, or 3-phase.

SMALL INDOOR EQUIPMENTS occupy little space. Available in 1-, 2-, or 3-phase ratings up to 90 kvar at 230 volts; 180 kvar at 460, 575, 2400, 4160, 4800 and 7200 volts.

LARGE INDOOR EQUIPMENTS—Large capacity in a single block. Ratings up to 630 kvar, 230 volts; 1260 kvar, 460 and 575 volts; and 2520 kvar, 2400 to 13,800 volts. With or without breakers.

POLE-TYPE OUTDOOR EQUIPMENTS—Completely weatherproof, all-welded steel housing. Pole or base mounting. For primary circuits, 2400, 4160, 4800, and 7200 volts. Ratings up to 180 kvar, 1-, 2-, or 3-phase.

LARGE OUTDOOR EQUIPMENTS—Large capacity in a single block. Weatherproof. With or without circuit breakers. Available in same voltage, kvar, and phase ratings as large indoor equipments.

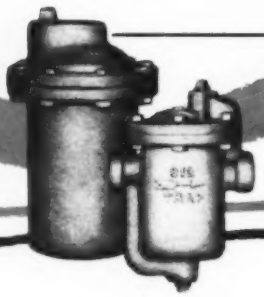
GENERAL ELECTRIC

407-107-5700

ARMSTRONG UNIT* TRAPPING

$2500 DAILY GAS SAVING
Heineman Chemical Co., Crosby, Pa.

still pays...



* ARMSTRONG UNIT TRAPPING

WHAT? It is systematic planning of trapping to provide an individual trap of correct size and type for each separate steam condensing space.

WHY? Prevents short-circuiting, air locking, water pockets, sluggish drainage. Purges both air and condensate.

WHERE? Applicable to every place where steam is used for power, process, or heating work.

WHEN? The sooner the better.

HOW? Your local Armstrong representative . . . Armstrong Machine Works . . . or the Armstrong Steam Trap Book will give you complete information.

ARMSTRONG MACHINE WORKS pioneered UNIT TRAPPING* back in the days when it was customary to pipe a half dozen, or more, drain lines into one big pot type trap . . . when traps were considered "a necessary evil" . . . when the main idea was to use as few traps as possible. Armstrong made it practical and profitable to use UNIT TRAPPING* by developing:

1. A trap that does not require attention. (All Armstrong traps are non-airbinding and self-scrubbing).
2. Small traps with big capacity. (Unexcelled—thanks to Armstrong's patented leverage).
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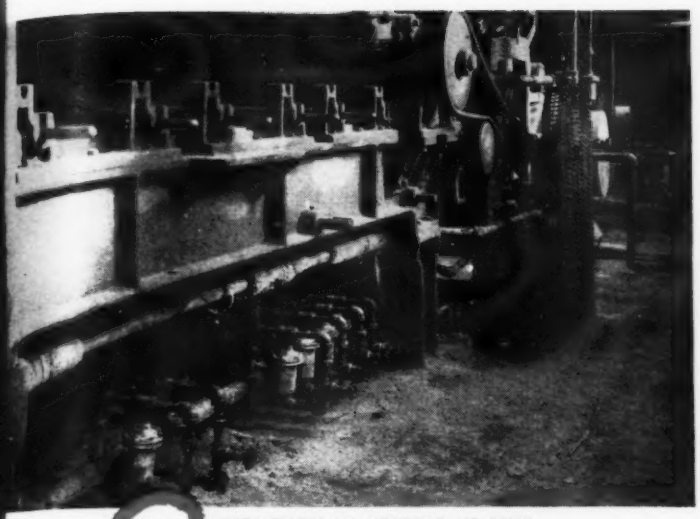

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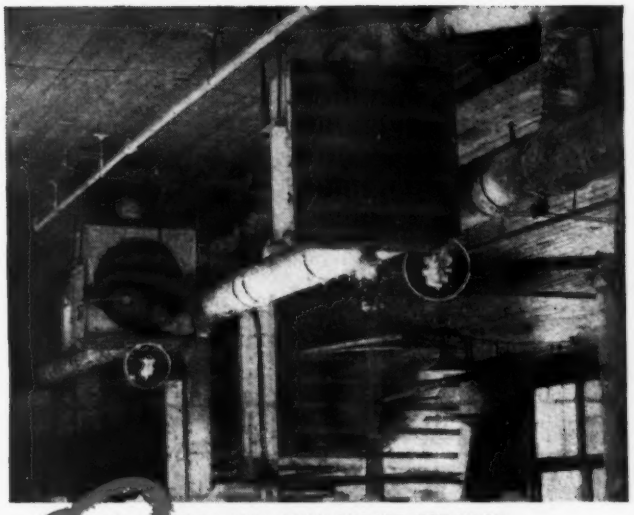

170 TONS LESS COAL BURNED PER YEAR
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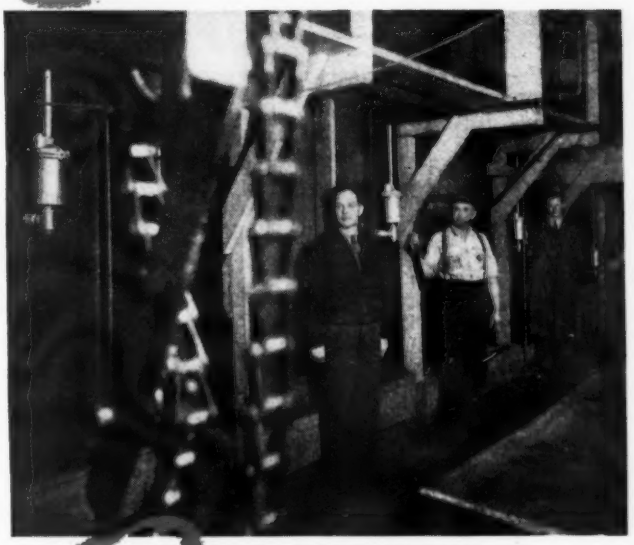

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Fig. 2125
Bronze Gate

Fig. 123
"N-M-D" Globe
(Non Metallic Disc)

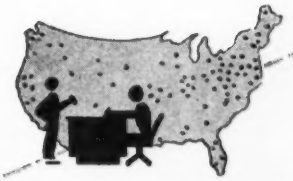
LUNKENHEIMER VALVES . . .

Fig. 16-P
"Renewo"
Globe

Fig. 1430
Iron Body Gate

Fig. 1938
Steel Gate

BRONZE, IRON, STEEL, AND CORROSION-RESISTANT ALLOY VALVES, 125 TO 2500 LB. S. P.



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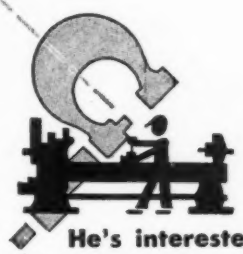
Remember—in utmost economy plus superior efficiency, Lunkenheimer products offer you *greater value per valve dollar* . . .



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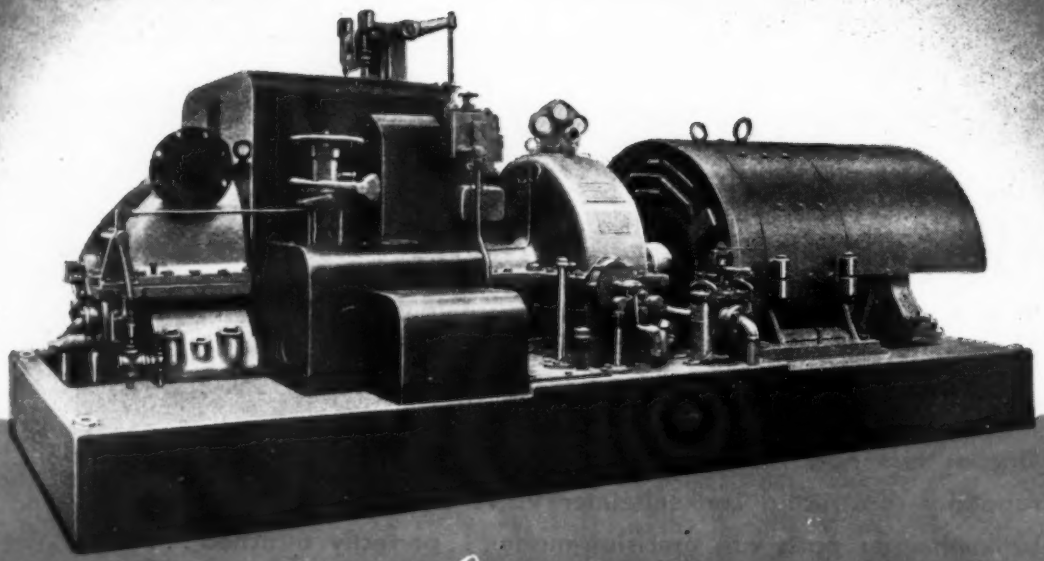

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T-4

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JUNE, 1946

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A CROSS-INDEX OF SUBJECTS FOR THE MONTH

PLANT OPERATING METHODS, MAINTENANCE AND SAFETY
STEAM GENERATION, FUELS, FIRING AND COMBUSTION
TURBINES, ENGINES, AUXILIARIES; HYDRO POWER
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TRANSMISSION, LUBRICATION
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INSTRUMENTS, CONTROLS
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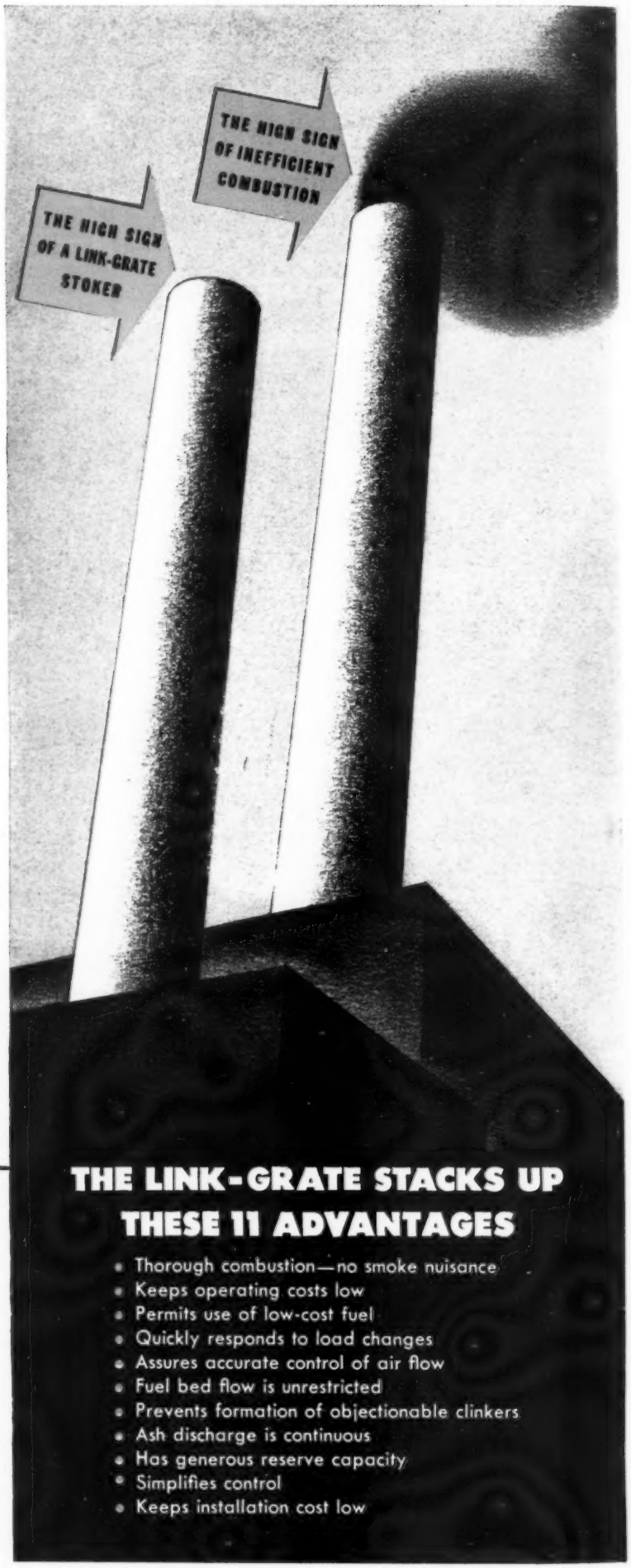
READ YOUR

SMOKE SIGNALS



THE LINK-GRATE STACKS UP THESE 11 ADVANTAGES

- Thorough combustion—no smoke nuisance
- Keeps operating costs low
- Permits use of low-cost fuel
- Quickly responds to load changes
- Assures accurate control of air flow
- Fuel bed flow is unrestricted
- Prevents formation of objectionable clinkers
- Ash discharge is continuous
- Has generous reserve capacity
- Simplifies control
- Keeps installation cost low

smoke abatement saves you $ $ $ $

Note the almost negligible amount of smoke from the stacks of this International Harvester Company plant at Springfield, Ohio, where 6 retort SDL 36 Link-Grate Stokers are used to fire boilers with 60,000-pound steam capacity. (Photograph is not retouched.)

Smoke abatement means more coal burned . . . less coal "up the flue" as soot . . . and more steam per pound of coal. With a Westinghouse Link-Grate Stoker, you get these advantages and many more—as has been proved in dozens of installations from coast to coast.

The Link-Grate action maintains a regular combustion rate by continuously processing the fuel bed to keep it porous. With this action, a positive motion at the rear of the stoker permits a uniform flow of coal over the underfeed section to keep the burning lanes open.

In Link-Grate action, the grates first hinge upward to break open the fuel bed and let low-pressure air flow through the grates. The reverse movement of the grates crumbles and conveys the burning fuel.

This conveying movement of the Link-Grate keeps the ash coming continuously off the discharge plate. This does away with periodic dumping and reduces labor. Clinkers are not a problem.

Since the fuel bed is always porous, the Link-Grate Stoker can meet suddenly increased steam demands quickly with full combustion efficiency.

Get the complete information about the Link-Grate before you make an investment in stokers. If possible, see one in operation. Your nearest Westinghouse office will be glad to arrange an appointment with a user. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-50471

Show Link-Grate Movies in Your Own Office. A 15-minute sound moving picture has been produced to show in detail the operation of a Link-Grate Stoker. Whether you can visit an actual Link-Grate Stoker in operation or not, this interesting 16 mm film will show you its action and explain its points of superiority while you sit at your desk. To borrow a print of this film for your own private showing, write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

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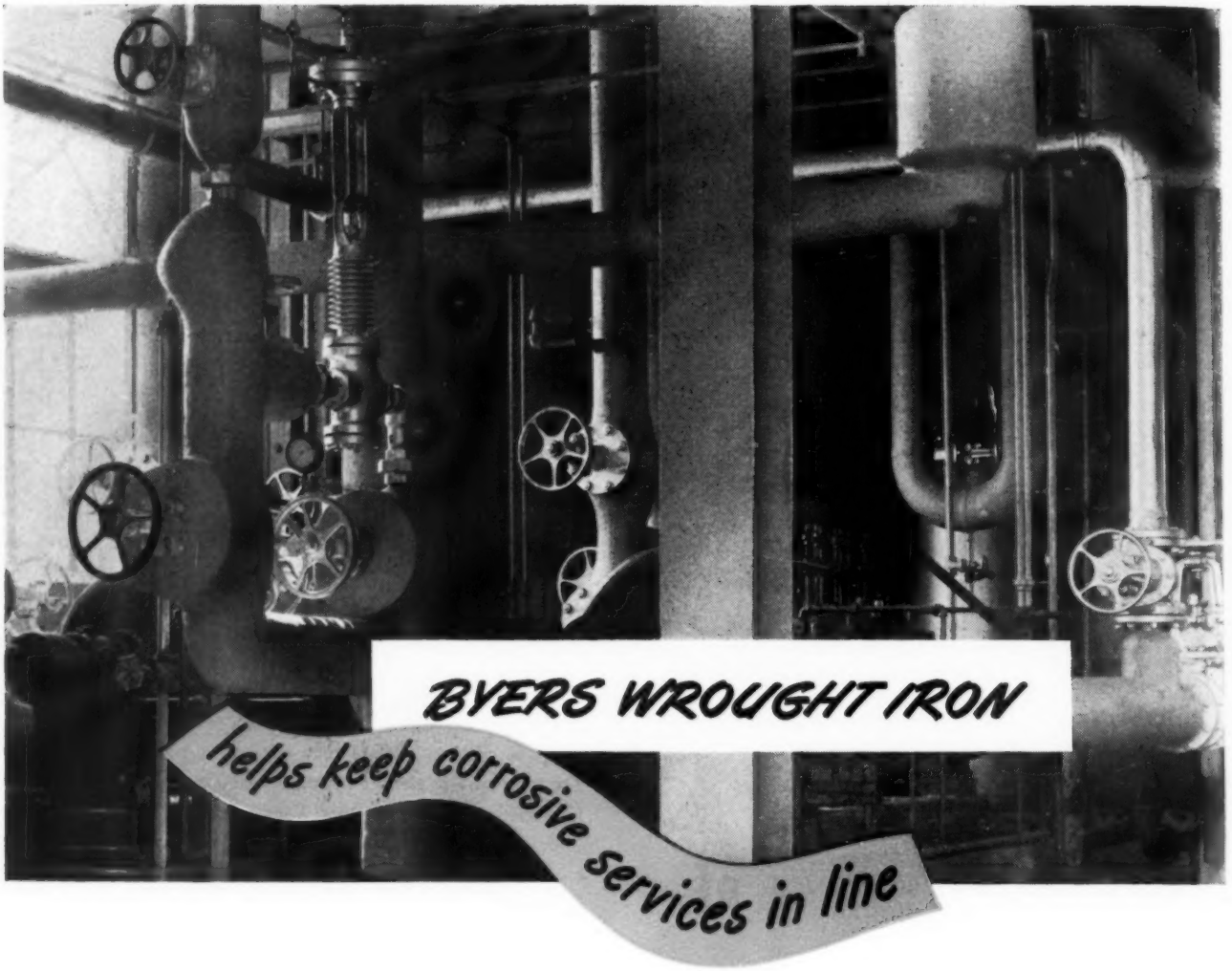
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Link-Grate STOKERS



Both appearance and performance received proper weight in the design of this boiler room piping layout in the United States Naval Air Station at Corpus Christi, Texas. The efficiency suggested by the attractive arrangement is confirmed by the careful selection of material for each service. As one example . . . in suction lines, discharge lines, boiler connections, condensate returns and hot water lines, where corrosion threatens useful life, Byers Wrought Iron was installed.

Wrought iron is particularly well fitted to withstand the corrosive conditions encountered in all these services, as engineering records can testify. One engineer reported not long ago that wrought iron pipe was installed in his boiler room 24 years ago. Only recently were there any signs that replacements were necessary. Conditions vary so widely that what would be excellent life in one locality might be short life in another, but engineering experience indicates that under any given set of conditions, wrought iron can generally be expected to last longer, and to show a lower cost-per-year.

Most piping replacements are not made necessary by complete failure of the pipe, but by holes that start from severe pitting. The unique structure and composition of Byers Wrought Iron help to prevent such failures. Tiny fibers of glass-like silicate slag are threaded through the main body of high-purity iron. These fibers act like baffles, to halt and disperse corrosive attack uniformly over the entire surface. The initial protective scale is anchored by these fibers, and so serves as a shield for the underlying metal.

When you are considering the repair or construction of any piping services, you may find some helpful information in our bulletin, "Wrought Iron for Piping Systems." Ask for a copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Seattle, San Francisco.

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GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE ALLOY STEELS · OPEN HEARTH ALLOY STEELS
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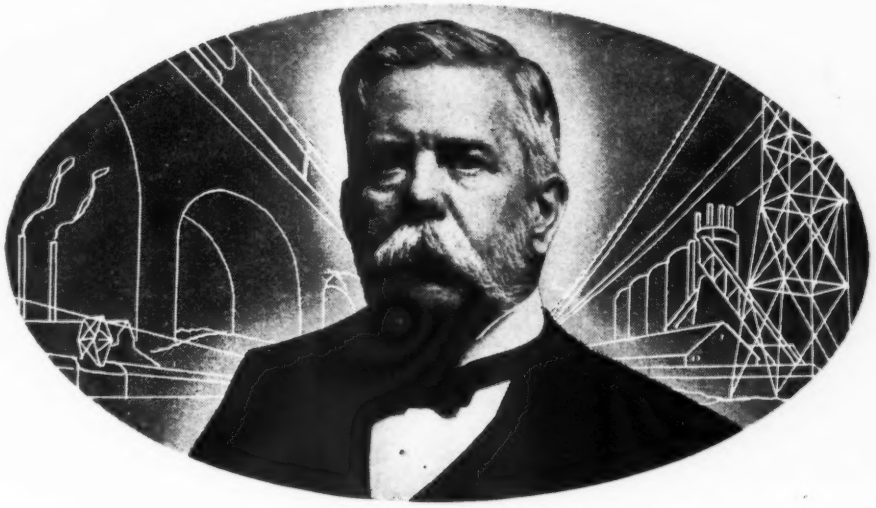
POWER

PHILIP W SWAIN, EDITOR • JUNE 1946 • ESTABLISHED IN 1882



The Century of George Westinghouse

GEORGE WESTINGHOUSE was born October 6, 1846. His centennial year finds him honored throughout the world for his vast contributions to modern technical civilization — particularly in the fields of power and transportation.

A true engineer, he could sense a technical need, invent a solution, make it work and win its commercial acceptance. He could work alone if need be, but he preferred the paths of leadership and cooperation.

Like so many other great men, Westinghouse got going while still young. He was barely 19 when he won his first patent—for a rotary steam engine. And he kept right on inventing until his death in 1914.

Perhaps his best-known personal achievement is the air brake, without which modern rail transportation would be impossible. His lifelong interest in railroading fathered other contributions to safe and efficient transportation—notably the automatic signal system and the friction draft gear.

But railroading was only one of many interests. As early as 1884 Westinghouse started building direct-current lighting sets. By 1886 he was leading the fight for alternating-current distribution against the opposition of such influential leaders as Thomas A. Edison. Westinghouse and his associates perfected the Gaulard-Gibbs transformer, took over Tesla's induction motor, and pioneered the application of 60-cycle polyphase systems for light and power.

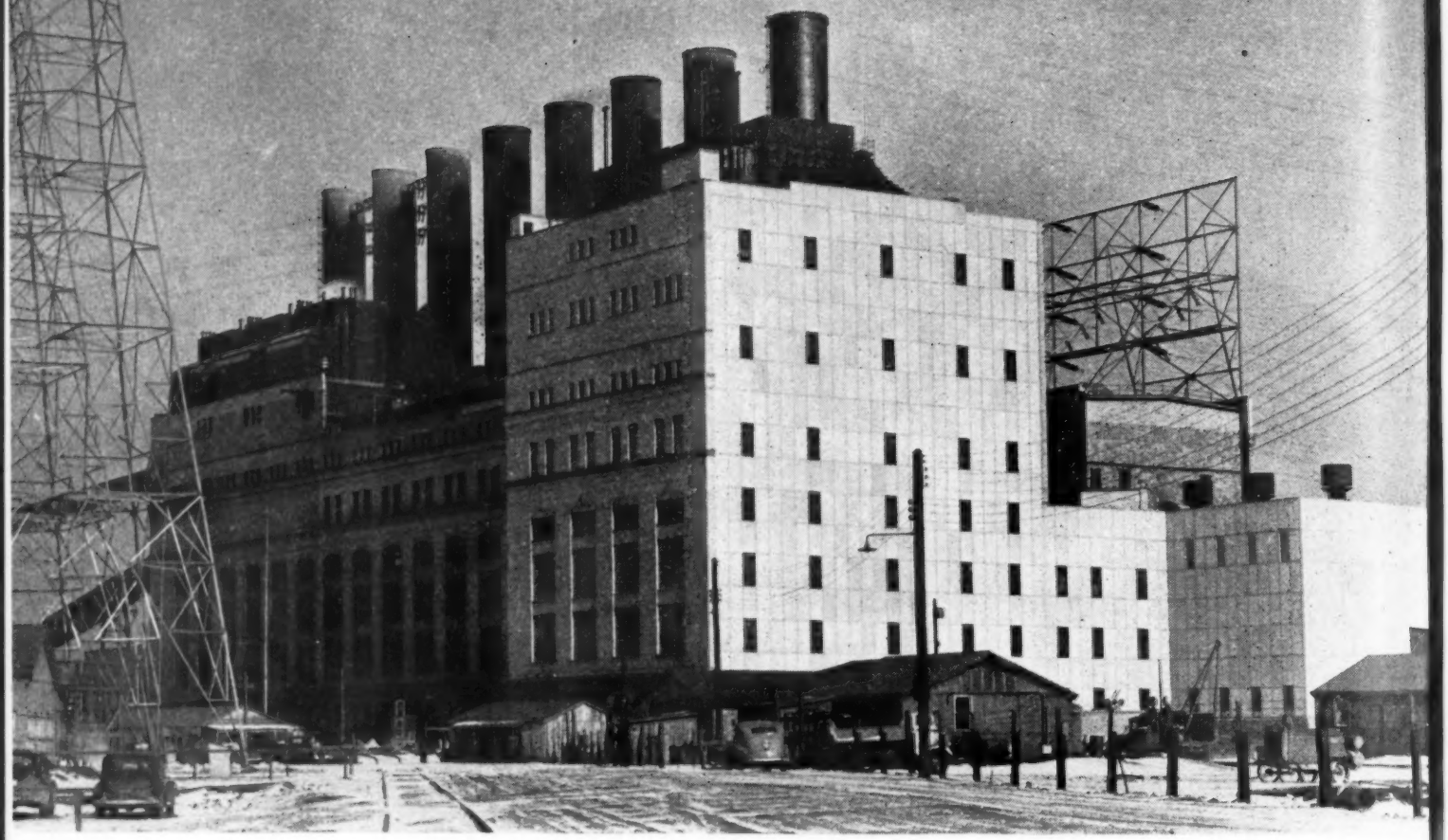
At Chicago's Columbian Exposition in 1893, Westinghouse staged his greatest public triumph, illumination of the whole Fair by tens of thousands of "stopper" incandescent lamps powered by twelve 75-ton, 1000-hp polyphase generating sets. This great demonstration, including many motor applications, broke down any remaining public opposition to ac.

The decision to generate alternating current at Niagara Falls was a natural sequel. By 1896 Westinghouse had three 5000-hp hydro alternators running at Niagara and supplying electricity to Buffalo 20 miles away.

Westinghouse was quick to grasp the importance of the steam turbine Sir Charles Parsons had invented for ship drive. He acquired the American rights, improved the machine and hitched it to an ac generator in 1899. The following year he installed at the Hartford Electric Light Company the first turbine-alternator in the country producing power at a central station.

George Westinghouse died 32 years ago, but his works live on as practical everyday services to hundreds of millions in this power age.

West Penn Power Adds New Unit At Springdale Station: 1



Details of new high-pressure, single-boiler and single-turbine installation at mine-mouth plant. Features largest boiler furnace, low heat release, plaster-type boiler casing, feedwater deaeration above atmospheric pressure, high plant efficiency

By G D BURLEIGH
Engineer, Power Department
West Penn Power Co

▶ ON DECEMBER 30, 1945 West Penn Power initially operated its new 80,000-kw high-pressure unit at the Springdale Station located on the Allegheny River. Besides being situated in one of the three principal industrial valleys of western Pennsylvania the Station is directly across the river from the mine that supplies the coal burned in its furnaces.

With WPB approval, received during the war days on June 19, 1944, construction was started June 21 and despite material and manpower shortages the unit was placed on the line 18 months later. The new unit, No. 7, is designed for steam conditions of 1250 psig, 925 F, exhausting at 1.5 in. Hg abs. Total cost was about $8,000,000, the engineering and construction being performed by Sanderson & Porter of New York City in collaboration with West Penn Power Co engineers.

TURBINE-GENERATOR. Normal unit rating, at 1250 psig, 925 F, 1.5 in. Hg abs, is 65,000 kw, and full-load rating 81,250 kw. Built by Westinghouse Electric Corp, it operates at 3600 rpm and has four bleed points for feedwater heating. The turbine is of tandem-compound double-flow impulse-reaction type.

The high-pressure single-flow turbine has one impulse stage and 23 stages of reaction blading while the low-pressure double-flow turbine has a total of 14 stages of reaction blading, seven in each end. There are two combination trip-throttle valves with integral steam strainers. An oil-relay governor controls the multivalve steam chests supplemented by a separate overspeed governor.

During shutdowns the turning gear revolves the spindle at 30 rpm to insure maintaining an adequate oil film. Turbine lubrication is provided through a shaft-mounted pump, oil reservoir, two oil coolers, steam-turbine-driven auxiliary oil pump with automatic starting, and a motor-driven auxiliary pump used when the spindle is on the turning gear. Most of this equipment is located in an oil room, equipped with an automatic water-spray system for fire protection.

The turbine drives an 11,500-v hydrogen-cooled generator rated at 81,250 kva with 0.5-psig hydrogen pressure and 93,450 kva with 15-psig pressure. The entire unit rests on a solid concrete foundation.

CONDENSER. Hung from the turbine exhaust nozzle is a Westinghouse 50,000-sq-ft surface condenser containing 9094 tubes, 7/8 in. OD, 18 gage, with 24 ft

active length. The tubes of arsenical Admiralty contain about 0.02 to 0.04% arsenic.

Water boxes are divided into two sections and a motor-operated division valve permits running both condenser sides with one circulating pump. Two motor-driven vertical pumps provided with Kingsbury thrust bearings supply a total of 94,000 gpm of cooling water.

Two condensate pumps designed to operate against a 300-ft head will deliver 700,000 lb per hr each. Two air ejectors, each consisting of two stages with two elements each, serve the main condenser. In addition there is a starting ejector that operates without a condenser and exhausts to the roof.

Hotwell-level records are continuously made by utilizing a Hagan pneumatic water-level transmitter in conjunction with Bailey pressure recorders. To keep a running check on condenser-tube cleanliness the pressure drop across the separate sections is recorded by action of a Hagan pneumatic differential-pressure transmitter operating a Bailey pressure recorder.

BOILER-ROOM EQUIPMENT

BOILER. The single Babcock & Wilcox radiant boiler has a rated capacity of 800,000 lb per hr steam flow. The radiant furnace is 40 ft wide, 22 ft deep and about 57 ft high, and is divided by a vertical radiant screen. An integral economizer and vertical-tubular air preheater are provided. This is believed to be the largest primary furnace in existence, and at full load has an approximate heat release of 19,400 Btu per cu ft per hr.

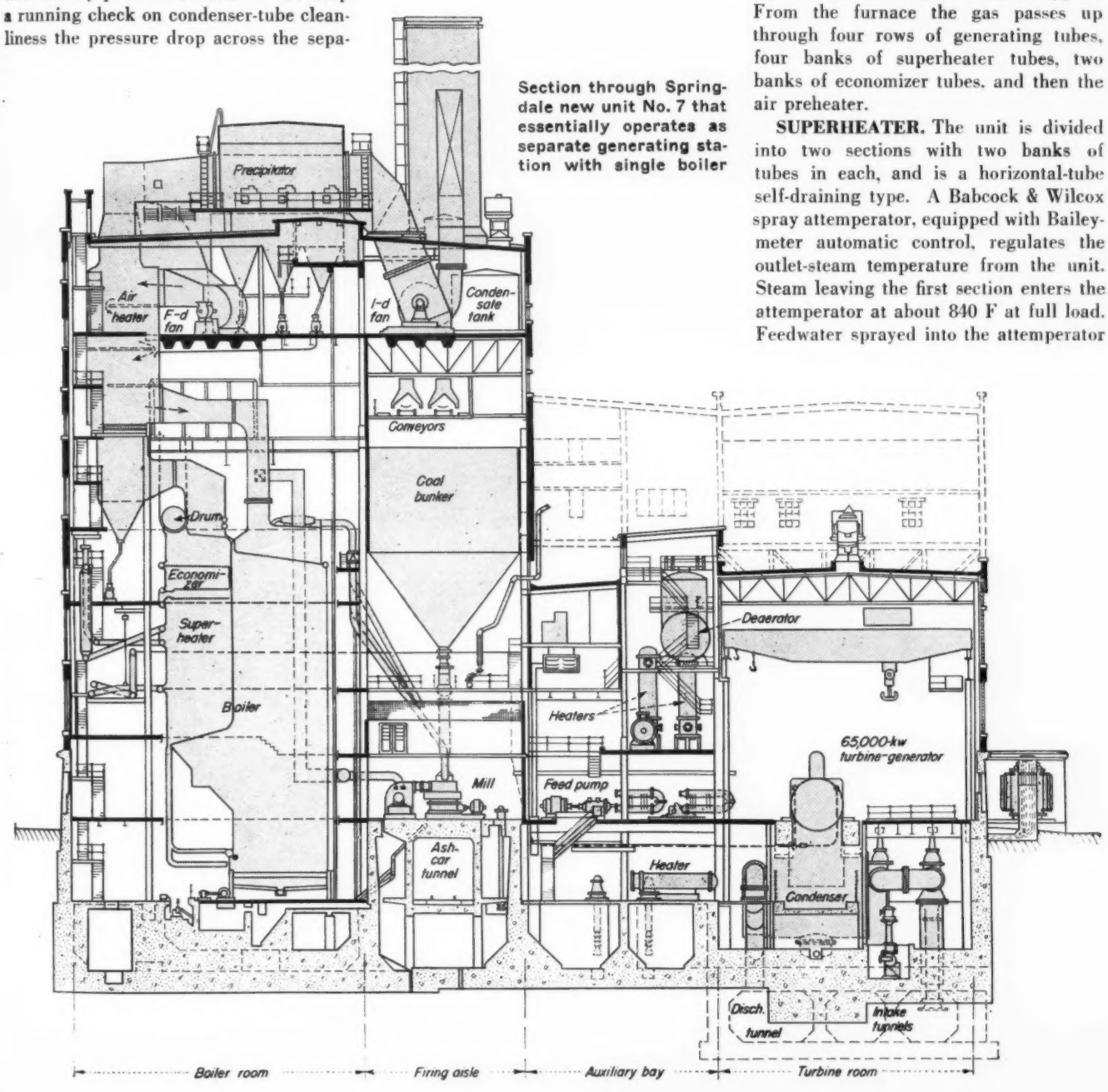
Boiler, superheater, economizer and attemperator are all entirely suspended from the building steel, thereby allowing the unit to expand freely in any direction. Water seals at the ashpit prevent any air infiltration due to change in boiler dimensions by expansion. The air heater is supported from the top and has the necessary expansion joints connecting it to the boiler.

No steel casing is provided for any portion of the furnace walls, roofs or drum. Instead, a hard-finish plaster wall, fastened directly to the insulation behind the wall tubes, serves as the casing and reduces air leakage to a minimum.

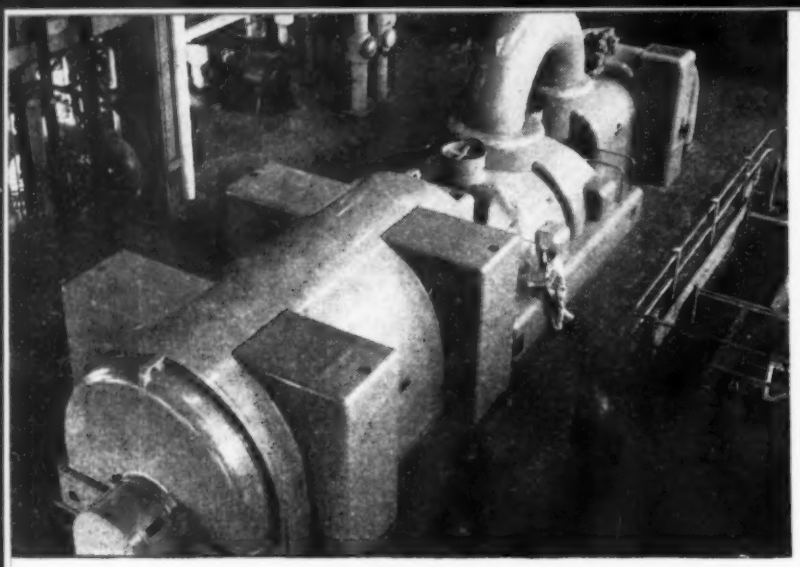
Total weight of the unit, including the air heater, is about 2000 tons, with the steam drum alone weighing 85 tons.

The ten burners are on top of the boiler, and the flame travel is vertically downward. The unit is designed with a dry bottom and has two ash hoppers. From the furnace the gas passes up through four rows of generating tubes, four banks of superheater tubes, two banks of economizer tubes, and then the air preheater.

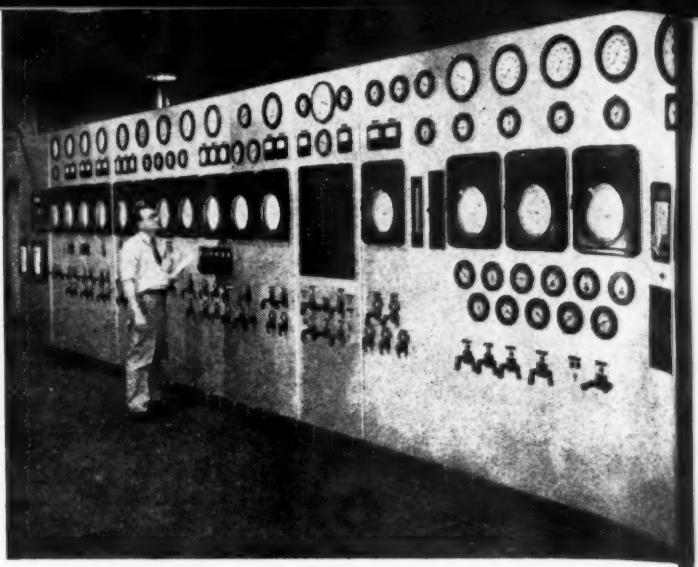
SUPERHEATER. The unit is divided into two sections with two banks of tubes in each, and is a horizontal-tube self-draining type. A Babcock & Wilcox spray attemperator, equipped with Bailey-meter automatic control, regulates the outlet-steam temperature from the unit. Steam leaving the first section enters the attemperator at about 840 F at full load. Feedwater sprayed into the attemperator



Section through Springdale new unit No. 7 that essentially operates as separate generating station with single boiler



New turbine-generator with normal rating of 65,000 kw and full-load rating of 81,250 kw with 1250 psig, 950 F steam



Turbine, pump and heater control board located on turbine-room floor centralizes supervisory instruments in one spot

reduces the steam entering the second superheater section to about 650 F. The steam finally leaves with a temperature of 925 F.

Attemperator water flow is automatically controlled by the leaving-steam temperature with added influences being given to the rate of desuperheating by changes in the gas-flow rate. With this 3-element control any changes in steam-flow rate are anticipated and the steam temperature is kept constant with variable ratings.

Superheater outlet header is made in two sections and the piping extends in expansion loops, terminating at the steam header attached to the building steel.

SOOT BLOWERS. Vulcan steam soot blowers arranged for program control clean the boiler tubes. Two retractable blowers and six rotary type are provided on each boiler side. The operator simply pushes a button to start the program and the blowers then operate automatically, one at a time, through the entire sequence. If desired, any group of blowers or any one blower can be operated.

PULVERIZERS. There are five Babcock & Wilcox Type E pulverizers with fan feeder blowers and 2-speed table-type feeders. Coal is fed to the pulverizers through Seco coal valves, and each mill is equipped with Seco automatic coal scales. Each pulverizer of 10-ton capacity is equipped with two outlets. which feed to the multitip burners. Bailey Meter Co supplied the automatic mill-level control. Mill-blower suction pressure and coal-air temperature are regulated by Hagan automatic control.

Tempering air to the mills is taken from the mill room by the fuel blowers.

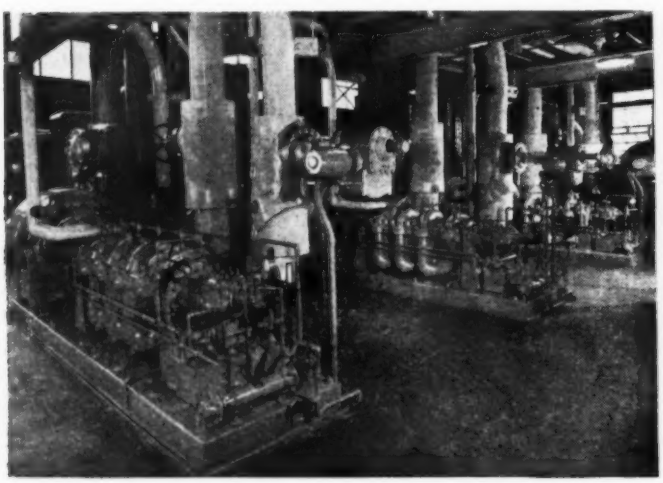
BOILER FANS. Two forced-draft fans and two induced-draft fans built by Sturtevant are located well above the boiler as shown in the station cross-section. They are all vane controlled and driven by single-speed motors.

An installation of monorails permits handling the fans and motors from any part of the installation to an open hatch, where they may be lowered to the ground floor by means of an 8-ton electric hoist.

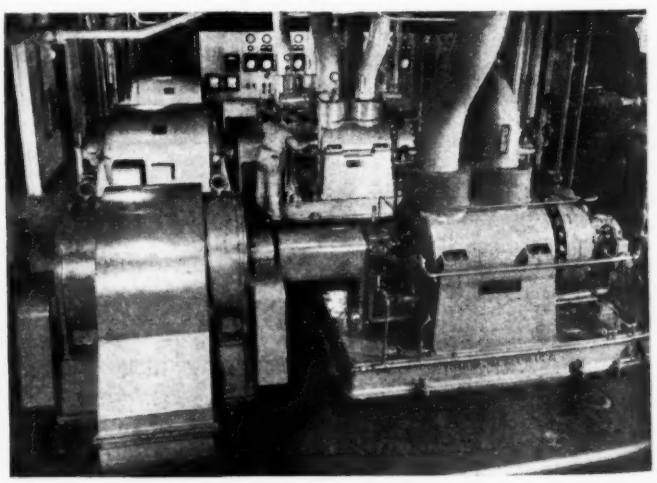
DUST COLLECTOR. Cottrell electrostatic precipitator, with a guaranteed efficiency of 95%, precedes the i-d fans in the gas circuit. The rated gas capacity, at a temperature range of 325 to 425 F, is 400,000 cfm. The steel collecting electrodes are cleared by periodic mechanical rapping. This is entirely automatic, and may be set for frequency of cleanings as desired. Collected dust is removed by a hydro-mix system.

FEEDWATER CONTROL. A Bailey 3-element feedwater control regulates the boiler-drum water level. Regulating valve opening is first controlled by the drum level, but any change in steam-flow water-flow relation anticipates drum-level change, and adjusts the valve accordingly. The control valve may be operated manually as desired. The 3-element regulating valve and all the feed valves are located within a few feet of the boiler-control board.

COMBUSTION CONTROL. To main-



Three motor-driven feedwater booster pumps each rated at 1080 gpm, delivery press 450 psig, suction press 50 psig



Three motor-driven boiler-feed pumps of 500,000-lb-per-hr capacity each, delivery presssure 1840 psig, suction 440 psig

tain constant steam-header pressure. the master sender (Hagan control system) located in the panelboard inclosure normally controls the capacity dampers situated between each blower and mill. thereby regulating fuel-feed rate to the boiler. The air-flow rate, controlled by the vane opening on the f-d fans, changes to maintain the proper ratio to the heat input to the furnace.

Pressure drop across the Bailey orifice in the steam header measures heat input to the boiler. Draft loss across the air-preheater gas side measures the air flow. Furnace pressure controls i-d-fan vanes.

To prevent too much air from entering the furnace during abnormal operation. the control is adjusted to permit normal operation only so long as ample draft is available. An emergency condition resulting in a pressure in the furnace causes a reduction in the rate of f-d-fan input, which in turn will cut back on the fuel-feed rate.

There are several special features to this control such as a loading diaphragm on the master sender, which permits the steam pressure to be varied at will from the control board and a hand sender by which the furnace-draft-regulator setting can be changed, also from the control board.

The control may be operated wholly automatic, wholly manual, or any part or parts on automatic with the rest on manual. An air-lock system is provided to lock in place automatically each individual power unit in case of air failure. These locks release automatically on restoration of air-supply pressure.

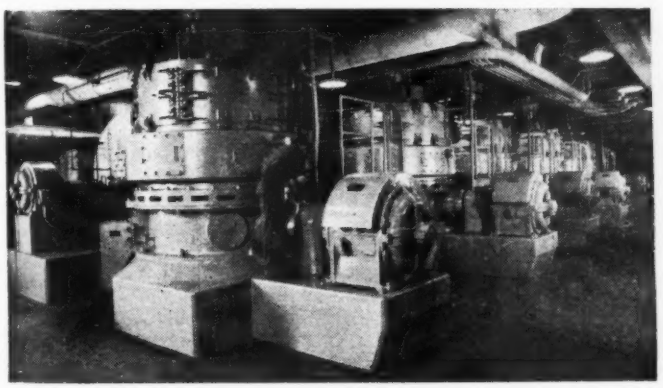
SAFETY VALVES. The boiler is equipped with seven 4-in. safety valves on the drum with a total capacity of 661,800 lb per hr, the first valve being set to open at 1550 psig and the last at 1580 psig. There are two 4-in. safety valves on the superheater with a total capacity of 139,230 lb per hr. These valves are set to open at 1475 and 1480 psig respectively. In addition the 3-in. power-control valve on the superheater outlet has a capacity of 122,000 lb per hr and opens at 1440 psig. This gives a total relieving capacity of 92,303 lb per hr.

BOILER AUXILIARY SUPPLY. Two 2300-v auxiliary bus sections supply the boiler auxiliaries. One bus section supplying one each of the i-d and f-d fans and three pulverizer mills and the other bus section supplying the remaining fans and two of the mills. Each i-d fan breaker is protected by an under-voltage relay, which also trips the f-d fan fed from the same bus section. This does not interfere with operation of the fans fed from the other section. When both i-d fan breakers are open, both f-d fan breakers are opened through an auxiliary relay.

When both f-d fan breakers are open all pulverizer-mill breakers are opened through an auxiliary relay. Each pulverizer-mill circuit feeds both the mill and blower motors. The coal feeder and scale motors are fed from a 2200/220-v transformer, which is connected to the mill motor circuit so that the pulverizer group must be started together. After the pulverizer group has been started. either the blower or mill motor can be stopped by opening disconnect switches.

ACKNOWLEDGMENT. Appreciation is expressed to coworkers J T Rummell and G C Spray, who contributed material used in preparation of this article.

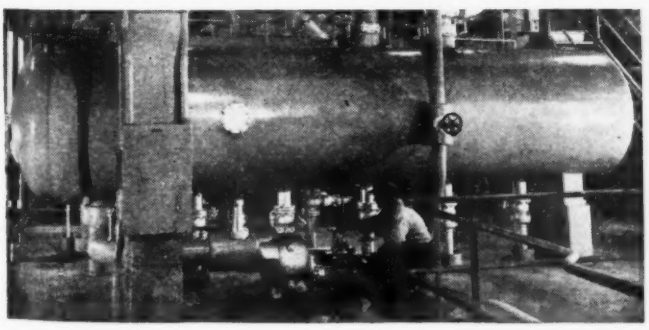
Further details of the Springdale installation will appear in the July issue.

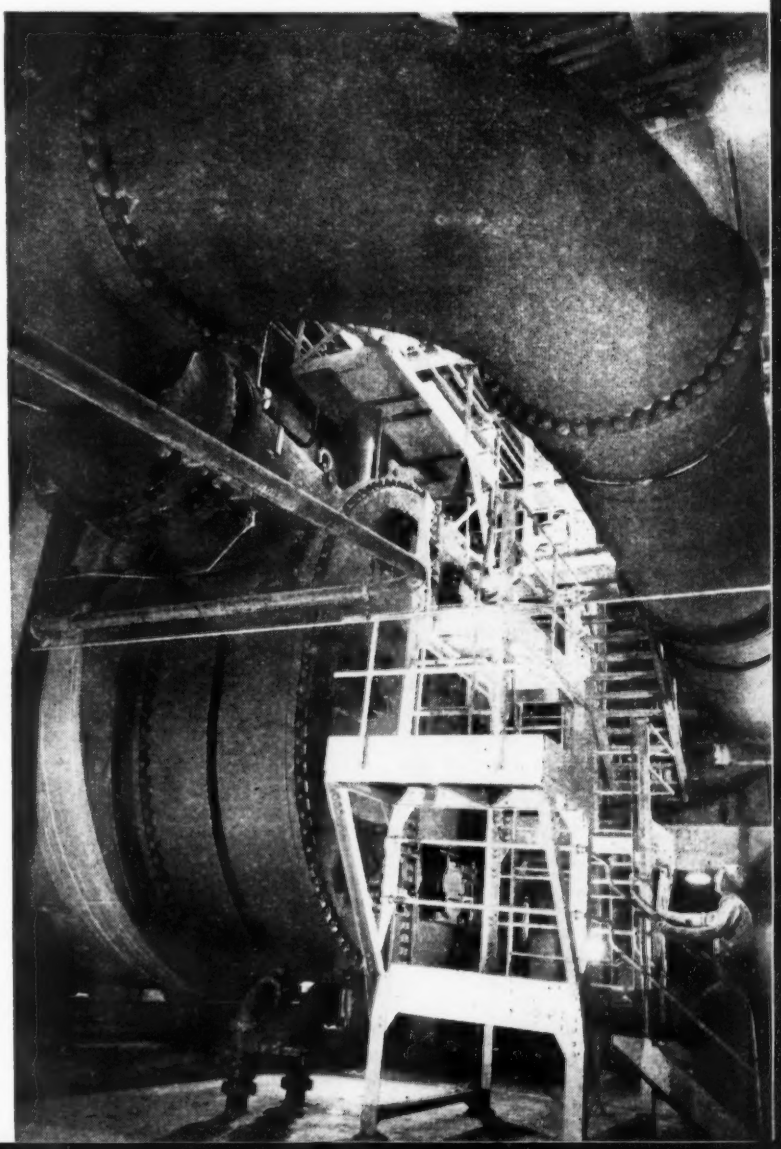


Above—Five pulverizing mills serve the new boiler; each, with a 10-ton-per-hr capacity, serves two of the ten burners

Right—Inlet end of 50,000-sq-ft main condenser with single pass, divided water boxes, and of the radial-flow design

Below—Evaporator, with capacity of 17,800 lb per hr from heated makeup at 35-psig pressure, discharges to deaerator





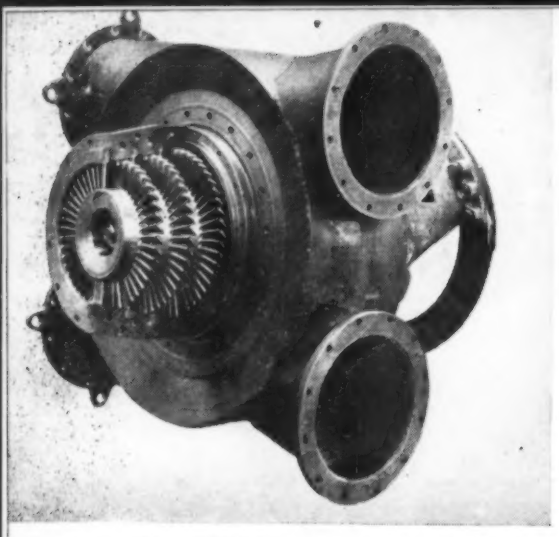


Fig. 6—High-pressure exhaust turbine for 1500-hp engine, designed for maximum supercharging pressure of 85 psia

Research Solves Problems of Highly Supercharged Diesels

Test results on 2-cycle engines at charging pressures as high as 85 psia reveal practicability of units operating at 28 to 43 psia supercharge and 170-215 psi bmep, says J Calderwood*

By S A TUCKER
McGraw-Hill World News

► SOME TEN YEARS AGO Sulzer Bros. Winterthur, Switzerland, began research aimed at developing the most promising applications of exhaust turbines in conjunction with reciprocating machinery, and of continuous-combustion gas turbines. The program followed three main lines: (1) highly supercharged reciprocating engines with exhaust turbines (2) reciprocating units in which substantially all useful work is done by the exhaust turbine and (3) continuous-combustion gas turbines operating on a new cycle. The latter were described in May POWER, pp 72-74; this article covers the development of highly supercharged diesels.

The object of this work was to increase the specific output of 2-cycle engines as the specific output of 4-cycle engines had been increased by turbocharging, but to an even greater extent. Choice of the opposed-piston design for the first researches resulted from consideration of the fact that, with expected high bmep's, cylinder diameter would be small and rotational speed high even for large outputs. With the single-piston loop-scavenged engine, scavenging difficulties and pressure losses increase with reduced cylinder size; the through-scavenged engine, on the other hand, does not suffer so greatly in this respect and best conditions obtain in opposed-piston units, which allow greatest effective port area. With high rpm and increased maximum pressures that occur with supercharging, stresses increase; in opposed-piston designs this may be taken care of more easily.

High-pressure supercharging can, however, be applied to normal single-piston loop-scavenged engines and after early tests both single- and multicylinder loop-scavenged engines were tested with supercharging, designs being suitably modified to meet increased stresses.

* Paper by J. Calderwood, presented before North-East Coast Institution of Engineers and Shipbuilders, April 5, 1946, is condensed in this article.

Fig. 1, left—Diagram of a unit with exhaust-turbine blower for first-stage compression of charging air, and engine-driven reciprocating pump for second stage.

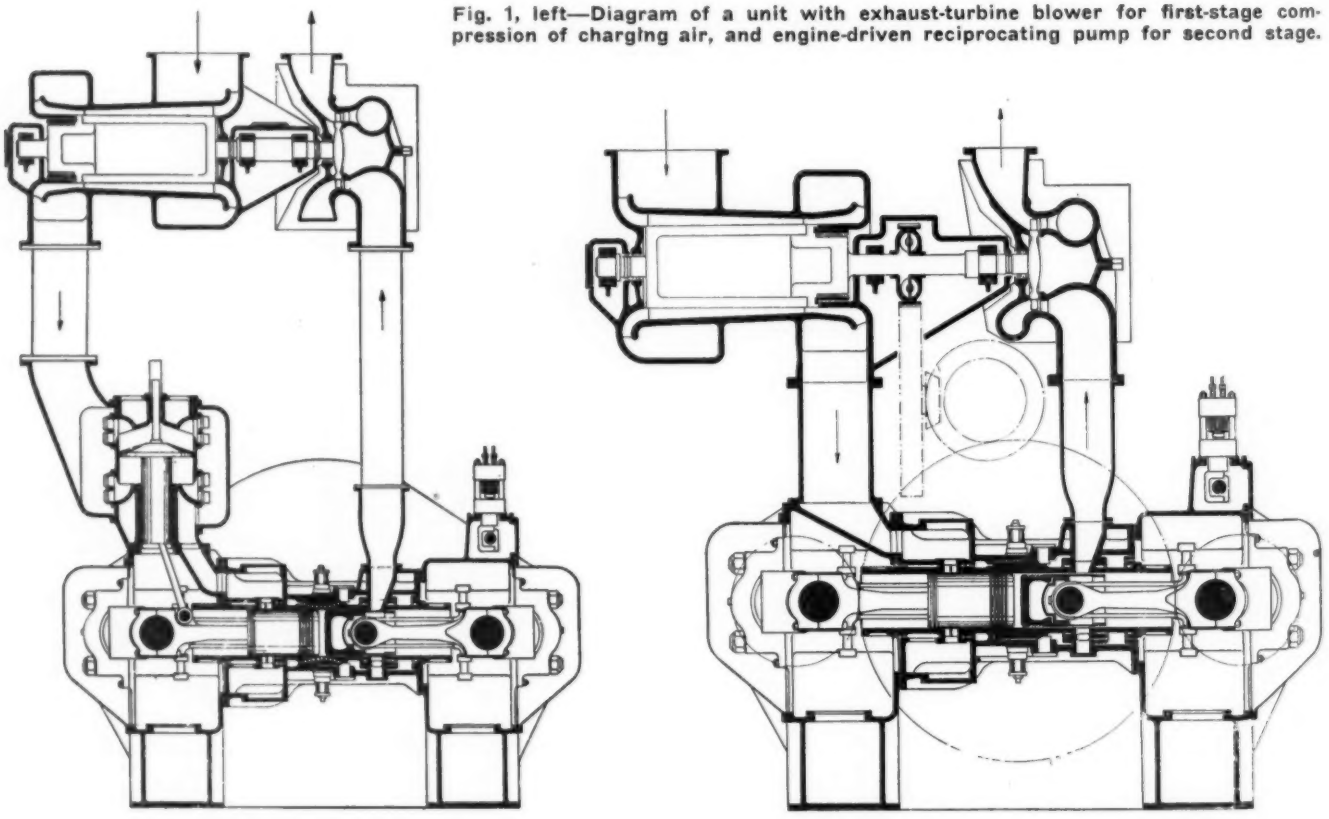
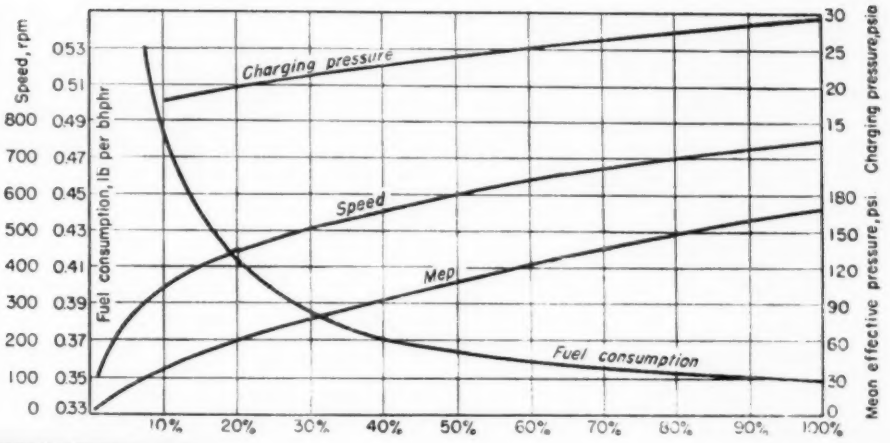
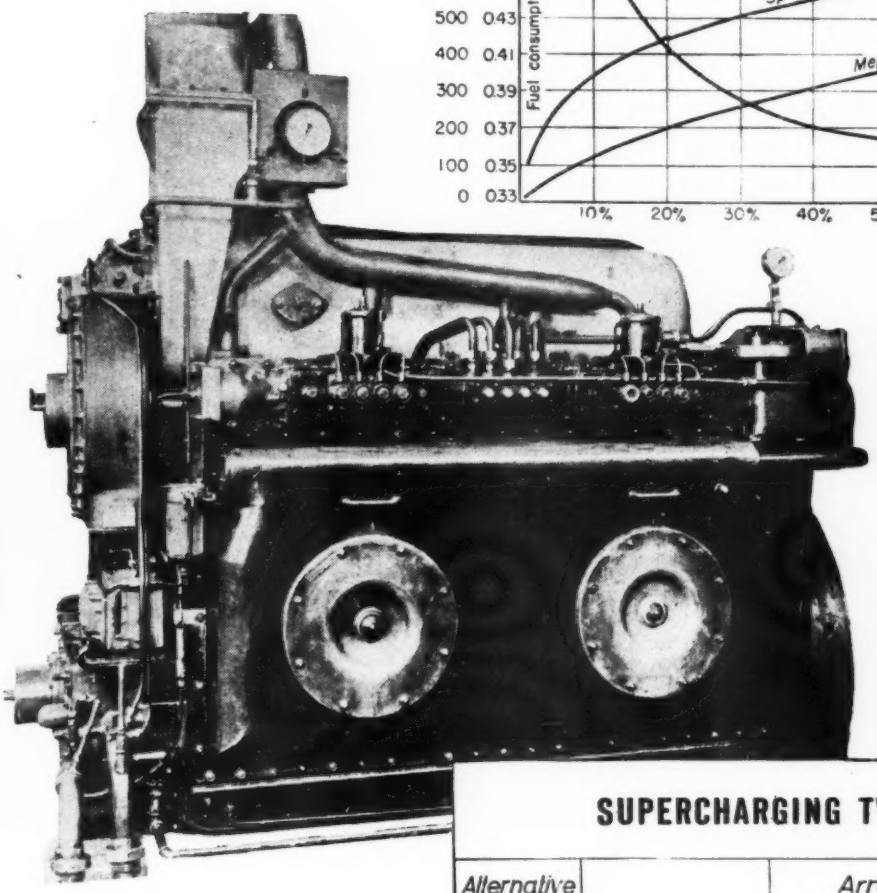


Fig. 4, below—First high-supercharge engine with exhaust turbine geared to the engine. Supercharging pressure is 28.5 psia, and bmep 170 psi. At 750 rpm and 1475-fpm piston speed, engine has continuous rating of 1200 bhp. Fig. 5, right—Test curves show best fuel consumption to be about 0.35 lb per bhphr





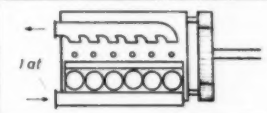
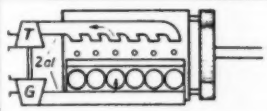
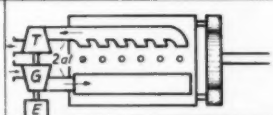
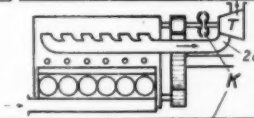
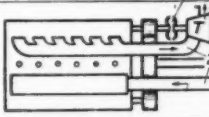
pump and absorbing turbine output by gearing it to the engine.

Fig. 1 and 2 show diagrammatically two methods of holding a balance between turbine power and air requirements. In Fig. 1 an exhaust-turbine blower provides first-stage compression, and a reciprocating pump coupled to the engine forms the second stage. Fig. 3 shows a turbine and blower geared to the engine so that at low loads engine power drives the blower while at maximum loads any excess of turbine power over blower load becomes available as useful output, through the gearing. This

The 2-cycle engine presents a different supercharging problem from the 4-cycle, in which the cylinder is self-charging and so draws in enough air to start even when the charging blower is at rest. In a 2-cycle engine the cylinder is not self-charging and it is impossible with an exhaust-turbine blower to start the engine unless the blower has a separate drive or some other means of scavenging is used in starting. Tests showed that even with this difficulty overcome, the exhaust turbine blower yielded only enough air for scavenging and pressure charging at high engine load. Thus at reduced loads lack of air for combustion caused output to fall off, further reducing turbine speed until the unit shut down.

Obviously, successful 2-cycle supercharging requires: (1) providing additional power to the blower mechanically or electrically (2) supplying additional air from an engine-driven pump or (3) providing all air from an engine-driven

SUPERCHARGING TWO-CYCLE ENGINES

Alternative		Arrangement	Reversibility
I	Not supercharged		fully reversible
II	Two stage supercharging		fully reversible
III	Supercharging set with additional drive		fully reversible
IV	Piston supercharging pump		limited power astern
V	Direct coupled supercharging set		not reversible

P = Scavenging pump T = Exhaust gas turbine G = Supercharging blower E = Electric motor K = Hydraulic coupling

Fig. 3—Diagrammatic comparison of various satisfactory arrangements for holding balance between turbine power and air requirements on supercharged 2-cycle units

requires an extremely flexible drive, a hydraulic coupling or similar device being used. In a third method, a reciprocating compressor driven by the engine shaft replaces the rotary compressor on the turbine shaft of Fig. 2. A separate turbine blower with supplementary electric drive might also be employed. Fig. 3 compares various satisfactory arrangements, each of which has its own advantages and disadvantages.

THERMAL-STRESS PROBLEMS

The research program included intensive study of the problem of increased thermal stress on pistons and cylinder liners and the effect of this, together with higher pressures, on the piston rings. In large unsupercharged engines output is limited not by considerations of scavenging, combustion or mechanical stresses but by heat stresses in pistons, liners and cylinder heads. For the highly supercharged engine the problem became one of limiting increased rate of heat flow to the various surfaces as far as possible and at the same time arranging for intensive cooling as close as possible to them. This is no new problem, but is intensified by need for higher coolant velocities combined with thinner walls without loss of mechanical strength.

Reducing heat-flow rate to a minimum depended largely on reaching the best relation between charging-air quantity and fuel burned. An extremely large charging compressor would reduce heat flow greatly but engine efficiency suffers from excessive charging-power requirements. Excessive supercharging pressure also causes starting difficulties, as high supercharge means a lower compression ratio. On the other hand, if fuel quantity increases in direct proportion to air quantity, cylinder temperatures become too severe. It therefore becomes necessary to run a supercharged engine with a larger margin below the load limit than an unsupercharged engine.

POWER BALANCE

After extensive tests it was found possible to strike a balance between these conflicting factors which, together with special provisions for heat removal, allowed bmep's as high as 250 psi without exceeding working-surface temperatures obtained in a large unsupercharged engine of the same power at 85 bmep.

While it is, of course, essential to insure reasonable working temperatures, it must be appreciated that this in itself is not the problem. Although working temperatures may be the same, working conditions differ in other ways between highly supercharged and unsupercharged engines. In spite of moderate working temperatures, wear of piston rings and piston seizures have proved a difficult problem at high rates of supercharge. Trials of a variety of means to get around these difficulties produced an apparently satisfactory solution but lack of long-duration tests make it impossible to say yet whether the problem is finally solved.

Tests and studies to determine the best balance between relative proportions of engine turbine and charging compressor showed that with correct proportions turbine and compressor power were about equal at something rather below the highest safe engine loading. Thus in arrangement *V* of Fig. 3 little power is transmitted through gears and coupling when operating at or near normal working load. At low load, turbine output falls off so that compressor power has to be transmitted through gear and coupling.

Scavenging presented no special difficulties in view of extensive data collected in previous researches on flow of scaveng-

(*Continued on page* 216)

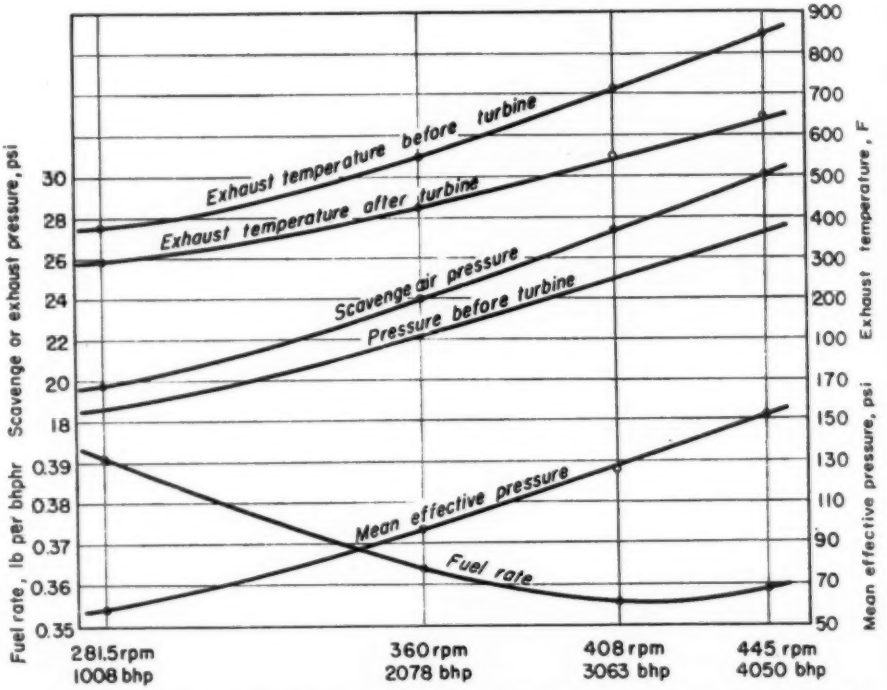


Fig. 8—Preliminary test curves of marine engine illustrated in the photo below

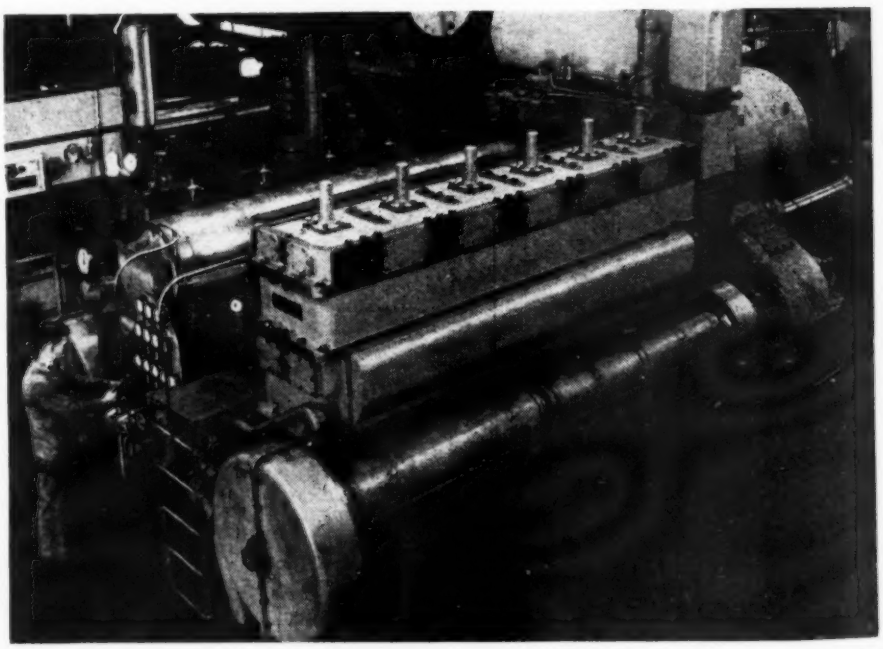


Fig. 7—Marine engine of six horizontally opposed cylinders with a bore of 12.6 in. and a stroke of 2x15.75 in. Output is 4000 bhp at 440 rpm and 150-psi bmep

How to Compare Steam Surface Condensers

A method that compares performances of condensers unlike in design and operating conditions and that may be used to evaluate either existing units or proposals for new installations

By C L WADDELL, *Chief Engineer,*
Condenser and Heater Engrg Div, Worthington Pump & Machinery Corp

▶ TO COMPARE THE RELATIVE MERIT of two condensers becomes a problem when it is recognized that the units' design and physical characteristics as well as their varying operating conditions affect their performance. The industry generally uses the *Standards of Heat Exchange Institute* to adjust actual condenser performance for variations in steam loading, tube cleanliness, cooling-water inlet temperature, water velocity through tubes, and tube size. However, there is no generally recognized method for adjusting actual performance for variations in design and physical characteristics of the condenser itself.

A method originally developed to aid the designer in checking the effect of design changes upon performance will be valuable to power-plant engineers in general. This will enable proper selection of condensing equipment for new installations and evaluation of relative merits of existing condensers.

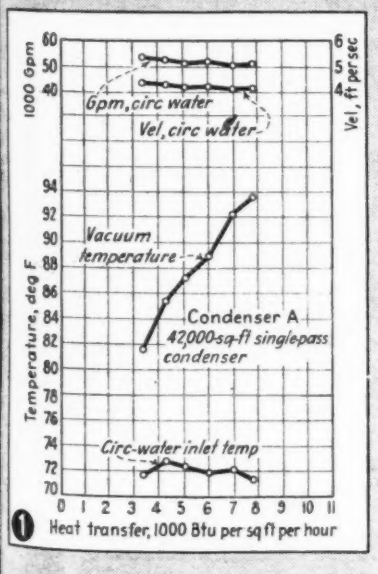
Two surface condensers of the same basic design but different physical characteristics may have the same cooling-water supply, the same water velocity through tubes of equal cleanliness, and the same unit steam loading and still not produce the same vacuum at the condenser inlet. It is quite possible that the condenser producing the poorer vacuum is the more efficient heat apparatus. A valid comparison cannot be made without adjusting performance by the method to be described for differences in the physical condenser characteristics. Any performance difference after such adjustments have been made for operating conditions and physical characteristics is attributable to design differences.

Description of Method. To illustrate, the method of comparing condensers is applied to two surface condensers, *A* and *B*, upon which accurate tests have been made in the field. Table I, p 72, lists individual condenser specifications and Table II the test data and calculated actual performance results. Performance calculations were made in conformance with *Standards of HEI*. Actual performance characteristics are plotted in Fig. 1 and 2, a sample performance calculation is given on the next page for test No. 181 on condenser *A*.

Because of variations in cooling-water quantity, velocity and inlet temperatures, the actual performance characteristics are not directly comparable. By adjusting these test data to common conditions of cooling-water quantity, velocity and inlet temperature in accordance with the *Standards of HEI* curves, Fig. 3, one step is made toward placing them on a comparable basis. Since comparisons are made at the same loading per unit of surface, the loading curves are not used.

Adjustment of test results to the equivalent for 4.5 ft per sec water velocity and 70-F inlet cooling-water temperature is also given in a sample calculation. Table III lists the adjusted performance data for condensers *A* and *B*, which are plotted in Fig. 4 and 5. These equivalent performance lines are for constant average heat-transfer rate of all the tests. Performance-line extension below lowest test point down to zero load is theoretical only. This method of showing adjusted performance for common conditions makes it easier to analyze test results and to check for test inaccuracies.

Though these data are adjusted to common operating conditions of water quantity, velocity and temperature as given in Fig. 4 and 5, they are not comparable and do not indicate relative performance merit. This comes from the difference in surface, number of tubes and tube length of the two condensers. These dif-



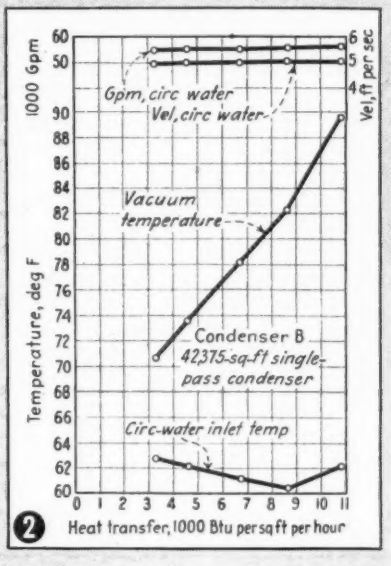


Fig. 1 and 2—Actual performance curves of two unlike condensers, A and B, at different operating conditions are not comparable until adjusted

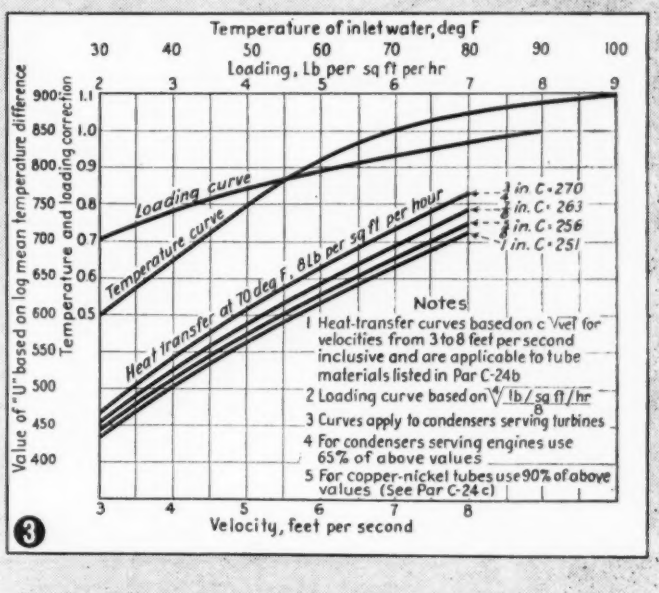
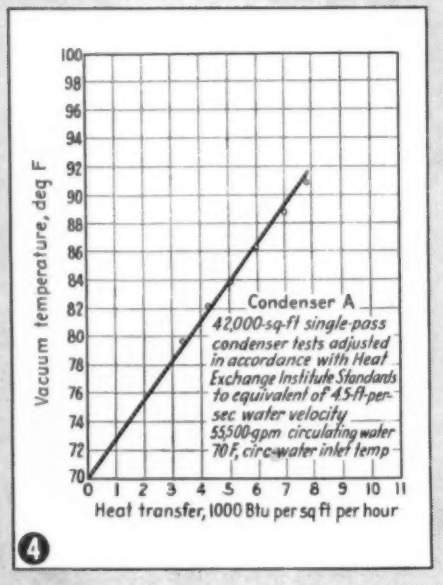

Temperature of inlet water, deg F
Loading, Lb per sq ft per hr
Value of "U" based on log mean temperature difference
Temperature and loading correction
Loading curve
Temperature curve
Heat transfer at 70 deg F, 8 lb per sq ft per hour
1 in. C-270
1¼ in. C-263
1½ in. C-256
2 in. C-251
Notes
1 Heat-transfer curves based on c √vel for velocities from 3 to 8 feet per second inclusive and are applicable to tube materials listed in Par C-24b
2 Loading curve based on ∛lb/sq ft/hr / 8
3 Curves apply to condensers serving turbines
4 For condensers serving engines use 65% of above values
5 For copper-nickel tubes use 90% of above values (See Par C-24c)
Velocity, feet per second
3

Fig. 3—Curves from "Standards of Heat Exchange Institute" used in the design of steam surface condensers


Vacuum temperature, deg F
Heat transfer, 1000 Btu per sq ft per hour
Condenser A
42,000-sq-ft single-pass condenser tests adjusted in accordance with Heat Exchange Institute Standards to equivalent of 4.5-ft-per-sec water velocity
55500-gpm circulating water
70 F, circ-water inlet temp
4

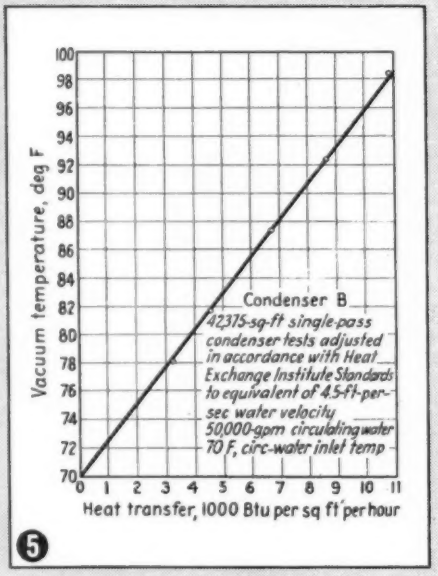

Vacuum temperature, deg F
Heat transfer, 1000 Btu per sq ft per hour
Condenser B
42,375-sq-ft single-pass condenser tests adjusted in accordance with Heat Exchange Institute Standards to equivalent of 4.5-ft-per-sec water velocity
50,000-gpm circulating water
70 F, circ-water inlet temp
5

Fig. 4 and 5—Performance of unlike condensers A and B corrected to common operating conditions of 4.5-ft-per-sec water velocity, 70-F inlet cooling-water temperature

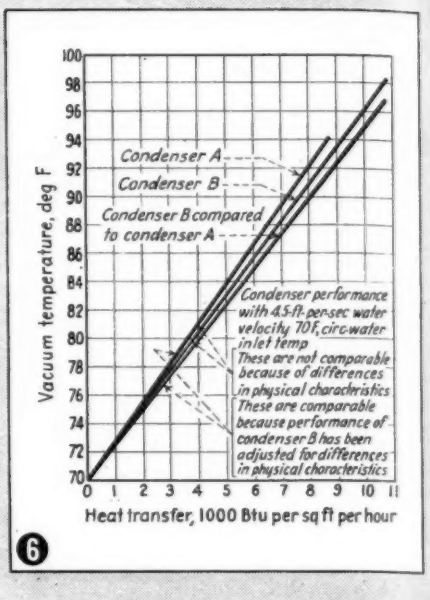

Vacuum temperature, deg F
Heat transfer, 1000 Btu per sq ft per hour
Condenser A
Condenser B
Condenser B compared to condenser A
Condenser performance with 4.5-ft-per-sec water velocity 70 F, circ-water inlet temp
These are not comparable because of differences in physical characteristics
These are comparable because performance of condenser B has been adjusted for differences in physical characteristics
6

Fig. 6—Performance curves of A and B are comparable after adjustment

ferences in physical characteristics produce different vacuums in the two condensers at constant water velocity, inlet-water temperature and constant-heat loading per unit of surface, and their effect must be considered when making comparisons of performance. This is shown by a third set of calculations, which are for condensers *A* and *B* based on the *Standards of HEI* and an assumed heat transfer of 7700 Btu per hr per sq ft. These calculations show that when operated under similar conditions condenser *A* should theoretically produce better vacuum or lower vacuum temperature than *B*.

Repeating these calculations for lower loads, the differences in vacuum and corresponding temperatures decrease as load decreases to a value of zero at no load. Since *A* should theoretically produce a better vacuum and correspondingly lower vacuum temperature than *B* the differences in vacuum temperature between the two condensers must be subtracted from the vacuum temperatures for *B* to obtain truly comparable performances.

CALCULATIONS ON CONDENSER A—Test 181

Performance Calculation From Test Data

$P_s = 1.085$ in. Hg abs $\quad T_1 = 71.69$ F
$T_s = 81.55$ F (from steam tables) $\quad T_2 = 76.96$ F
$T_r = T_2 - T_1 = 76.96 - 71.69 = 5.27$ F (1)
$H_1 = T_s - T_1 = 81.55 - 71.69 = 9.86$ F (2)
$H_2 = T_s - T_2 = 81.55 - 76.96 = 4.59$ F (3)
$\theta = T_r/\log_e (H_1/H_2) = 5.27/\log_e (9.86/4.59) = 6.9$ F (4)
$U = WH_s/S\theta = 150{,}400 \times 940/42{,}000 \times 6.9 = 488$ Btu (5)
$Q = WH_s/500T_r = 150{,}400 \times 940/500 \times 5.27 =$ 53,600 gpm (6)
where 500 converts lb per hr to gpm
$V = QG/(N/P) = 53{,}600 \times 0.677/(8360/1) =$ 4.34 ft per sec (7)

Adjustment of Test Results to 70-F Cooling-Water Temp, and 4.5-Ft-per-Sec Water Velocity

Temperature-adjustment factor $= F_{1c}/F_1 = 1/1.011 = 0.991$ (8)
Velocity-adjustment factor $= \sqrt{V_s/V} = \sqrt{4.5/4.34} = 1.018$ (9)
$U_c = U \times$ temp factor $\times$ vel factor $= 488 \times 0.991 \times 1.018 = 492$ Btu per sq ft per hr per deg F lmtd (10)
$Q_c = (V_cN/P)/G = (4.5 \times 8360/1)/0.677 = 55{,}500$ gpm (11)
$T_{rc} = WH_s/500Q_c = 150{,}400 \times 940/500 \times 55{,}500 = 5.1$ F (12)
$\theta_c = WH_s/SU_c = 150{,}400 \times 940/42{,}000 \times 492 = 6.85$ F (13)
$\log_e (H_{1c}/H_{2c}) = T_{rc}/\theta_c = 5.1/6.85 = 0.745$ (14)
$H_{1c}/H_{2c} =$ antilog$_e$ $0.745 = 2.107$ (15)
$H_{1c} = 2.107\ H_{2c}$ (16)
$H_{1c} - H_{2c} = T_{rc} = 5.1$ F (17)
Substituting (16) in (17)
$2.107\ H_{2c} - H_{2c} = 5.1$ F (18)
$H_{2c} = 5.1/1.107 = 4.62$ F (19)
$H_{1c} = T_{rc} + H_{2c} = 5.1 + 4.62 = 9.72$ F (20)
$T_{sc} = T_{1c} + H_{1c} = 70 + 9.72 = 79.72$ F (21)
$P_{sc} = 1.022$ in. Hg abs (from steam tables)

TABLE 1—CONDENSER SPECIFICATIONS FOR UNITS A AND B

	Unit A	*Unit B*
Surface, sq ft	42,000	42,375
Shell length, ft	22	24.67
Number of tubes	8360	7510
Tube outside diameter, in.	0.875	0.875
Tube wall thickness, No. Bwg	18	18
Number of water passes	1	1

THEORETICAL PERFORMANCE OF A AND B

At 70-F Cooling-Water Inlet Temperature, 4.5-Ft-per-Sec Water Velocity, and 7700-Btu-per-Hr-per-Sq-Ft Heat Transfer

	Unit A	*Unit B*	
S	42,000	42,375	
P	1	1	
L	22	24.67	
D	0.875	0.875	
N	8360	7510	
F_t	1	1	
V	4.5	4.5	
WH_s/S	7700	7700	
T_1	70	70	
F_2	1	1	
Calculated:			
$Q = (VN/P)/G =$	55,500	50,000	(22)
$T_r = WH_s/500Q =$	11.66	13.06	(23)
$U = F_1F_2F_3F_4C\sqrt{V} =$ (see Fig. 3)	558	558	(24)
$\theta = WH_s/SU =$	13.80	13.80	(25)
$\log_e (H_1/H_2) = T_r/\theta =$	0.846	0.947	(26)
$H_1/H_2 =$ antilog$_e$ $(T_r/\theta) =$	2.330	2.578	(27)
$H_2 = T_r/1[H_1/H_2) - 1] =$	8.77	8.28	(28)
$H_1 = T_r + H_2 =$	20.43	21.34	(29)
$T_s = T_1 + H_1 =$	90.43	91.34	(30)
P_s (from steam tables)	1.441	1.482	(31)

If the calculations had shown that B should theoretically perform better than A the differences in vacuum temperatures would have been added to the vacuum temperature of B to get truly comparable performance. The true comparative performance throughout the full range of loading is shown in Fig. 6. The two top performance lines are reproduced from Fig. 4 and 5 but are not directly comparable. Lowest line represents performance of B compared with A; top and bottom lines are directly comparable.

This method of performance comparison may be used in comparing single- with 2-pass condensers with accuracy equal to that when comparing units with the same number of passes. Adjustments are usually of greater magnitude.

Precautions. In this method of comparison take these precautions: (1) Make tests with accurate instruments and under the same approved test code. (2) Tubes must be clean or their cleanliness determined by test. (3) Have air-pump capacity ample to remove all air inleakage. (4) Run tests on the two units compared, at about the same service conditions to minimize any inaccuracies that might occur in adjusting to common operating conditions.

While only two surface condensers are compared to illustrate the method, it has been used in checking design progress on many units from 1926 to the present time. These condensers have had a wide range of design and physical characteristics and interestingly enough performance curves for all units of the same basic design superimpose on one another within the limits of test accuracy.

Though the relations developed are empirical rather than rational, this does not impair their usefulness in making valid comparisons. Slight inconsistencies that occasionally develop in empirical methods are evident in this one in that the change in over-all coefficient of heat transfer with loading for one condenser increases, and for the other decreases.

With the method outlined, performance of units can be compared from test and guarantee data, thereby helping to select the most economical installation.

Nomenclature

- C = constant for tube outside diameter
- D = tube outside diameter, in.
- F_1 = temperature factor
- F_2 = loading factor
- F_3 = tube-cleanliness factor
- F_4 = type factor (for turbines = 1, for engines = 0.65)
- G = cooling-water velocity at 1 gpm through tube, ft per sec
- H_1 = heat head, deg F
- H_2 = terminal difference, deg F
- H_4 = heat transferred to cooling water, Btu per lb steam condensed
- L = effective tube length, ft
- N = number of condenser tubes
- P = number of condenser-water passes
- P_1 = condenser-inlet pressure, in. Hg abs
- Q = circulating-water flow, gpm
- S = condenser surface, sq ft
- T_1 = cooling-water inlet temperature, deg F
- T_2 = cooling-water outlet temperature, deg F
- T_r = cooling-water temperature rise, deg F
- T_s = saturated-steam temperature at inlet pressure, deg F
- U = heat-transfer coefficient, Btu per sq ft per hr per deg F lmtd (θ)
- V = cooling-water velocity through tubes, ft per sec
- W = steam condensed, lb per hr
- θ = logarithmic mean-temperature difference, deg F

Subscript c designates adjusted value

TABLE II—TEST DATA AND CALCULATED ACTUAL PERFORMANCE OF CONDENSERS A AND B

	Condenser A						*Condenser B*				
Test number	181	176	175	182	183	180	4	3	2	1	6
Steam condensed, 1000 lb per hr	150.4	193.5	230.2	274.5	320.2	355.1	146.6	208.5	311.3	397.3	496.8
Heat released by condensed steam, Btu per lb	940	932	924	917	916	921	938	926	912	918	923
Heat to cooling water, 10^6 Btu per hr	141.3	180.2	212.5	251.8	293.2	326.7	137.4	193.0	283.5	364.5	458.0
Heat to cooling water, Btu per sq ft per hr	3365	4295	5060	5995	6985	7780	3247	4560	6700	8615	10,820
Pressure at condenser inlet, in. Hg abs	1.085	1.226	1.298	1.373	1.520	1.584	0.755	0.832	0.970	1.110	1.403
Saturated steam temperature at inlet, deg F	81.55	85.32	87.12	88.88	92.15	93.48	70.63	73.50	78.10	82.24	89.57
Cooling-water inlet temperature, deg F	71.69	72.67	72.36	71.86	72.12	71.38	62.76	62.08	61.11	60.36	62.09
Cooling-water outlet temperature, deg F	76.96	79.65	80.73	81.62	83.84	84.28	67.80	69.12	71.43	73.48	78.51
Cooling-water temperature rise, deg F	5.27	6.89	8.37	9.76	11.72	12.90	5.04	7.04	10.32	13.12	16.42
Heat head, deg F	9.86	12.56	14.76	17.02	20.03	22.10	7.87	11.42	16.99	21.88	27.48
Terminal difference, deg F	4.59	5.67	6.39	7.26	8.31	9.20	2.83	4.38	6.67	8.76	10.06
Logarithmic mean temperature difference, deg F	6.90	8.65	9.95	11.45	13.26	14.72	4.93	7.33	11.02	14.30	18.00
Heat transfer coefficient, Btu per hr, per sq ft, per deg F lmtd	488	497	509	524	526	528	659	623	608	602	601
Cooling-water circulated, 1000 gpm	53.6	52.3	50.8	51.5	50.0	50.7	54.5	55.0	55.0	55.5	55.8
Cooling-water velocity, ft per sec	4.34	4.24	4.12	4.17	4.05	4.10	4.90	4.95	4.95	5.00	5.03

TABLE III—ACTUAL PERFORMANCE OF CONDENSERS A AND B ADJUSTED TO 70-F INLET COOLING-WATER TEMPERATURE AND 4.5-FT-PER-SEC WATER VELOCITY

	Condenser A						*Condenser B*				
Test number	181	176	175	182	183	180	4	3	2	1	6
Steam condensed, 1000 lb per hr	150.4	193.5	230.2	274.5	320.2	355.1	146.6	208.5	311.3	397.3	496.8
Heat released by condensed steam, Btu per lb	940	932	924	917	916	921	938	926	912	918	923
Heat to cooling water, 10^6 Btu per hr	141.3	180.2	212.5	251.8	293.2	326.7	137.4	193.0	283.5	364.5	458.0
Heat to cooling water, Btu per sq ft per hr	3365	4295	5060	5995	6985	7780	3247	4560	6700	8615	10,820
Heat transfer coefficient, Btu per hr per sq ft per deg F lmtd	488	497	509	524	526	528	659	623	608	602	601
Temperature adjustment factor to 70 F	0.991	0.984	0.988	0.990	0.989	0.992	1.053	1.061	1.073	1.081	1.061
Velocity adjustment factor to 4.5 ft per sec	1.018	1.030	1.046	1.040	1.054	1.048	0.958	0.954	0.954	0.950	0.947
Adjusted heat-transfer coefficient, Btu per hr, per sq ft, per deg F lmtd	492	503	525	539	548	548	665	631	622	619	605
Cooling-water flow at 4.5 ft per sec, 1000 gpm	55.5	55.5	55.5	55.5	55.5	55.5	50.0	50.0	50.0	50.0	50.0
Cooling-water temperature rise adjusted for gpm flow at 4.5 ft per sec, deg F	5.10	6.50	7.67	9.08	10.58	11.78	5.50	7.72	11.33	14.57	18.32
Adjusted logarithmic mean temperature difference, deg F	6.85	8.54	9.65	11.11	12.75	14.20	4.89	7.23	10.77	13.90	17.89
Adjusted heat head, deg F	9.72	12.20	13.90	16.30	18.80	20.90	8.14	11.77	17.40	22.45	28.60
Adjusted terminal difference, deg F	4.62	5.70	6.23	7.22	8.22	9.12	2.64	4.05	6.07	7.88	10.28
Adjusted vacuum temperature, deg F	79.72	82.20	83.90	86.30	88.80	90.90	78.14	81.77	87.40	92.45	98.60
Adjusted condenser inlet pressure, in Hg abs	1.022	1.108	1.171	1.265	1.370	1.462	0.971	1.093	1.310	1.535	1.853

Well-Chosen Alarm and Shutdown Instruments Guard Life and Equipment: II

There is no one answer to every emergency-alarm problem. Best solution: Select the simplest, most positive device that does the job for it is the last barrier between normal operation and spoiled product or wrecked plant equipment

By C S BEARD,
Instrument Engineer, Southern California Gas Co

▶ FLAME-FAILURE DEVICES used extensively on stills and direct-fired heaters employ: (1) current flow through the flame or (2) an electric eye.

In Fig. 1, control current flows from an electrode in the main or pilot burner, through the ionized flame to the metal parts. Flame extinguishment from any cause opens the circuit immediately. Since ionization, caused by combustion, closes the circuit, alarm action after flame failure does not wait until the electrode cools, a delay common in many less critical bimetallic alarms and shutoffs. This system is not applicable to liquid fuels, which might themselves complete the circuit.

The electric eye, Fig. 2, serves for oils and pulverized coal. This instrument focuses a photoelectric tube on the burning fuel or, for gas firing, on an incandescent element in the flame. This control may be set up to alarm simply upon flame failure, or evacuate the firebox, relight the pilot, and relight the main flame. Speed with which an explosive mixture can accumulate in a firebox is often faster than that at which the firebrick loses its incandescence, and the relatively small investment in flame-failure protection can save thousands of dollars damage and decrease the danger to personnel.

INSURING CONTINUOUS FLOW

Among the many examples where continued movement of equipment is critical to personnel or process are: (1) an endless belt transporting a product from hopper to kiln (2) a fan or blower. It may be simpler to signal rotation of the latter two than to detect and sound an alarm for a change in effect, such as differential-pressure loss across a drier or accumulation of dangerous gas.

One instrument, a plugging switch, acts like a governor to make or break contact at a critical speed. Contact with the moving equipment accomplishes the desired action, Fig. 3. This method is sometimes more positive than connecting an alarm on the electric circuit to the prime mover. The key in a blower shaft may shear off, the belt break, or other accidents occur, which do not affect continuous movement of the prime mover, but cause decided changes in the equipment.

Movement of a piston- or telescopic-type gas holder becomes hazardous when it approaches the filled or empty position. Here there is essentially no pressure change so some other means of alarm must be used. Trigger switches actuated by arms on the holder's moving part can be located to notify that limits are being approached.

A Selsyn motor system consists of two motors having their rotors locked in phase with each other electrically. Thus, movement of the transmitting unit causes the receiver to follow equally. Transmitter shaft can be rotated by mounting a wheel on it, and allowing the wheel to contact the moving equipment as when an electrode is fed to an electric furnace. Here the transmitting-motor speed must be such that some predetermined rotation, for example 180 deg, is equivalent to the electrode length that can be fed before a new one must be inserted. Contactors on the receiver energize an alarm.

ONE DEVICE FOR ECONOMY

Probably the commonest instrument in chemical process is that for pH control. The complete unit, consisting of potentiometer and cells, is quite expensive, and from an economic standpoint, might justify deviating from the practice of using a separate instrument for the alarm. Alarms for pH are adaptable to such applications as waste water and condensate treatment, and chemical blending. Standard on-off electric units or pneumatic

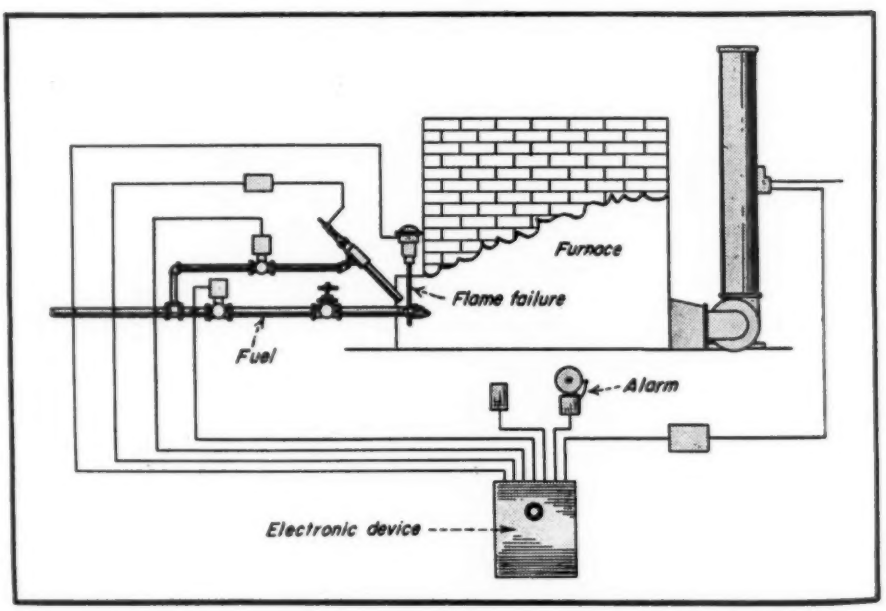


Fig. 1—Ionized gas in the burner flame completes a restraining circuit in the alarm. When flame fails, circuit is broken and tripping relay sounds an alarm

controls may be used as high- or low-limit switches.

Electrical conductivity alarms are adaptations of the indicating or recording instruments employing conductivity cells as legs of a wheatstone bridge circuit—one containing the standard solution and the other the sample. This alarm is valuable in boiler-water control, possible leakage of an electrolyte into condenser water, slaking of dolomite.

INSPECTION PROGRAM

Thermal conductivity finds application when it is necessary to identify the presence of gas or limit its concentration in a gas mixture. Many industries have to control the atmosphere, or sound a warning if it becomes toxic or explosive. A number of dependable combustible-gas alarms are available, Fig. 4. Samples may be drawn from various points into one instrument and an alarm lamp identify the location. Small amounts of carbon monoxide are readily measured by detecting the heat given off by the oxidation of iodine pentoxide, hopcalite, or other substances. Effect of the heat upon a thermopile may be calibrated to alarm at unsafe concentrations.

A workable protective installation is not complete unless a procedure for the inspection and actual operation of each emergency instrument is set up in detail and an inspection schedule decided upon. Consider the importance of the operation protected, and the possibility of the instrument being thrown out of adjustment. It is difficult to determine the necessary frequency of inspections, as the instrument could become inoperative from external causes immediately after testing. But experience shows that monthly coverage is about right for most commercial instruments.

When testing, simulate actual operating conditions; bring the emergency instrument to the alarm point by manipulation of the equipment being protected. Where this procedure is detrimental to operation, set up a comparable set of conditions to energize the instrument artificially.

INSPECTOR'S RESPONSIBILITY

With proper cooperation from departments and thoughtful detailing of test equipment and procedures, one man can inspect a large number of instruments. He must have or acquire a working knowledge of instruments, safety valves, electrical equipment and plant processes. Organization and plant size determine whether: (1) separate departments handle the different classes of instruments (2) instrument department handles safety valves (3) electrical department handles instruments (4) any other possible combination.

In any event, the inspector should not be a maintenance repairman in one of the departments because he must have authority to report directly to management, sending copies of his report to the head of each maintenance group. An item on this report showing improper operation of any emergency device must be considered an order to the department concerned to remedy the trouble immediately. This assures full protection.

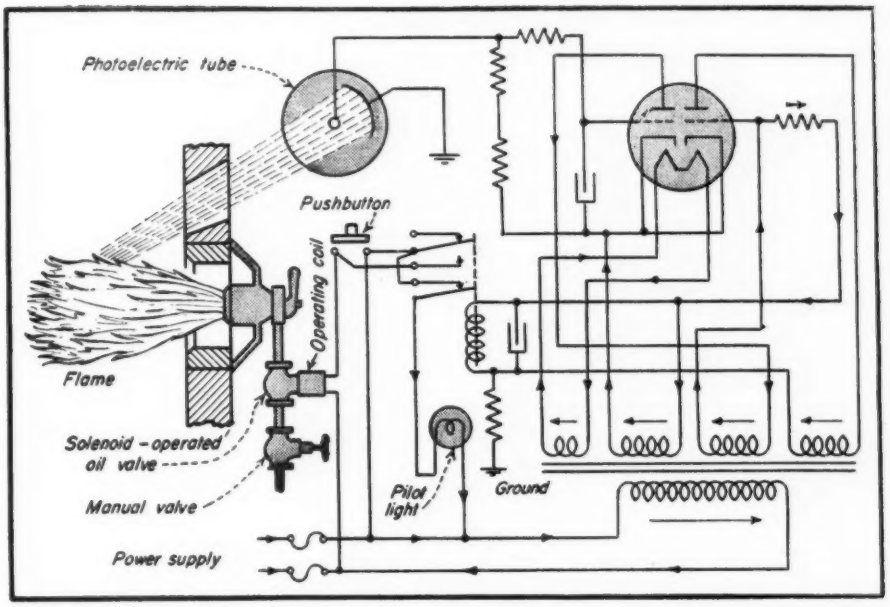


Fig. 2—Flame-failure protection for an oil-fired furnace uses a photoelectric tube to watch the flame and control the grid potential of an electron-tube alarm

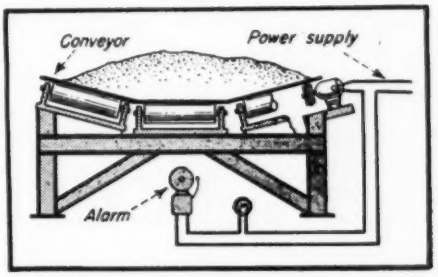


Fig. 3—A flyball switch makes contact if speed rises or falls below normal and provides more direct warning than a relay connected in the motor circuit

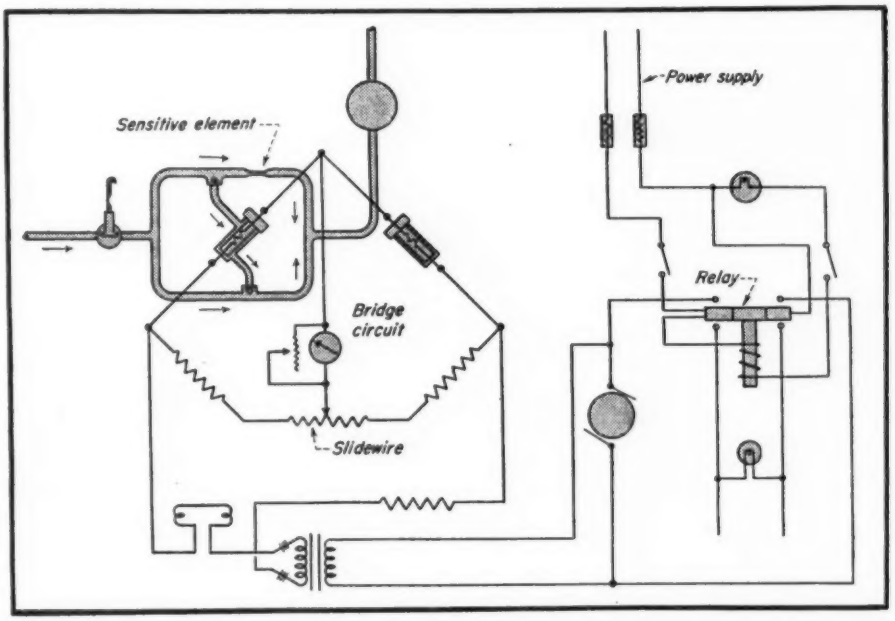


Fig. 4—In a gas alarm, samples from various areas in the process may be drawn into one instrument, and individual lamps used to designate the faulty location

The Economics of ATOMIC Power

This paper, presented at the annual AIEE meeting, says the electrical end of atomic power has been overemphasized. The process steam field offers more chance to save coal. In general the public has been somewhat oversold on possible dollar savings

By PHILIP W SWAIN
Editor of POWER

▶ BLUNTLY STATED, MY ASSIGNMENT is to reach economic conclusions regarding atomic power without possessing the essential data. The Smyth report left much unsaid. Since Smyth, no significant new facts have been made public. The vast atomic-energy literature of this "post-Smyth" period is a restatement of Smyth, or a presentation of what was public knowledge before Smyth, or an interpretation, or a prediction. For sound reasons of national security, all further information of fundamental character has been kept secret.

THINGS WE DON'T KNOW

Following are values unknown to me, but essential to valid conclusions regarding atomic power economics: (1) present and estimated future cost of natural uranium (2) present and estimated future cost of natural uranium sufficiently purified for use in piles (3) present and estimated future cost of Uranium 235 in various concentrations (in U235-U238 mixtures) (4) pile efficiency obtainable with various concentrations (5) maximum practicable temperature at which pile can be operated.

This paper must therefore be presented on an "if" basis. It can't even be on the level of the schoolbook problem where the data though imaginary, are at least *given*. It should perhaps be retitled, "How to prepare to think economically about atomic power if and when necessary data become available."

Fortunately the world does know the composition of commercial uranium and the energy released by the fission of U235, so let's start there: Natural uranium contains 0.7% of U235; 140 lb of natural uranium contain 1 lb of U235. The complete fission of the atoms in one pound of U235 releases in heat energy 11.4 million kwhr, or 39 billion Btu, or 30 trillion ftlb, or the heat in 1400 tons of good coal.

Since 140 lb of natural uranium contains one pound of U235, one pound of natural uranium equals ten tons of coal. From this one might carelessly conclude (but please don't) that coal would have to sell for 20¢ a ton to compete with natural uranium as a fuel, if natural uranium cost $2 per pound.

NATURAL-URANIUM PILES

The daily operation of the big carbon-uranium piles at Hanford, Wash., is proof that natural uranium can be used to generate heat at a controlled rate, with the artificial element plutonium as a byproduct, even though at Hanford the plutonium (substitute for U235 in bombs) is the product, and the heat an unwanted byproduct which has been wasted to the Columbia River.

Here are some of the things we are permitted to know about these natural-uranium piles, great carbon blocks, water-cooled, with holes in which are inserted uranium cylinders sealed in aluminum cans. These piles "cook" at a completely controllable rate. They give off heat, and produce plutonium by the action on the U238 of neutrons produced by U235 fission. Long before the mass of U235 in the pile has been thus consumed the pile slows down, "poisoned" by the accumulation of fission products, so the charge must either be renewed completely or taken out and chemically cleaned up.

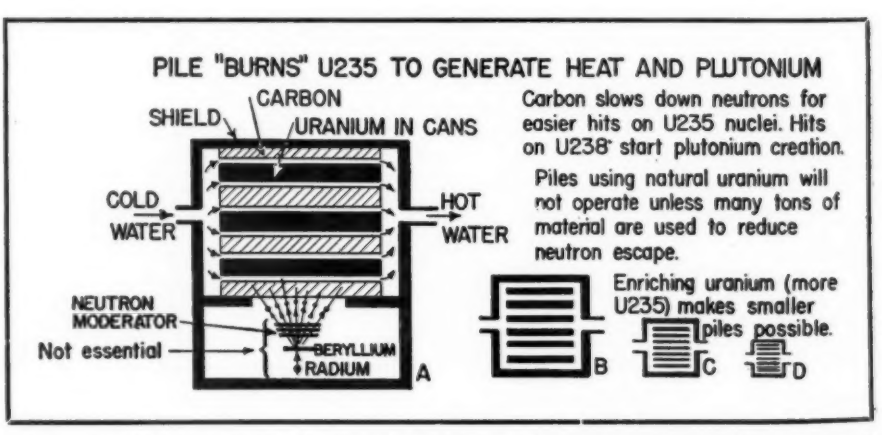
To work at all, a natural-uranium pile must be very large. With only 0.7% of U235, natural uranium is a very "weak" atomic fuel. One might view it as the nuclear equivalent of a very high-ash lignite disinclined to burn at all. If the pile is too small it won't maintain a chain reaction. Also, if the natural-uranium pile gets too hot the neutrons are thereby speeded up, make fewer nuclear hits and the chain reaction dies out unless the pile is made extra large to protect against this dropping off.

If the U235 is enriched —that is, raised above the natural 0.7% by the gaseous diffusion process or other means—a smaller pile can be made to work, and a larger percentage of the available heat of the U235 recovered before the charge must be renewed.

This matter of limiting size may not be particularly important for nonmobile applications of atomic power. The need for heavy shielding and expert operation and close government inspection would in any case limit economic atomic-heat installations to fairly large plants—central electric power plants, central heating plants, and large industrial steam and power plants.

EFFECT OF U235 CONCENTRATION

Neglecting the size limitation, therefore, it would appear that the optimum percentage of U235 would be determined


PILE "BURNS" U235 TO GENERATE HEAT AND PLUTONIUM
SHIELD
CARBON
URANIUM IN CANS
Carbon slows down neutrons for easier hits on U235 nuclei. Hits on U238 start plutonium creation.
COLD WATER
HOT WATER
Piles using natural uranium will not operate unless many tons of material are used to reduce neutron escape.
NEUTRON MODERATOR
Not essential
BERYLLIUM
RADIUM
A
B
Enriching uranium (more U235) makes smaller piles possible.
C
D

Pile burns U235 to generate heat and plutonium. Natural-uranium-carbon pile must be large to operate. Enrichment in U235 percentage permits smaller-pile operation

by balancing the cost of concentrating against the lower pile efficiency with low concentrations.

Here my estimates suffer greatly from lack of any data—even the roughest approximations. I can merely say that the efficiency of the natural-uranium pile is extremely low, that a moderate increase in U235 gives a substantial improvement in pile efficiency, that the cost of concentrating the U235 is very high, particularly in the early stages.

To dramatize this last statement, consider 140 lb of natural uranium containing 1 lb of U235, or 0.7%. Getting rid of 69.5 lb of U238 raises the U235 percentage to 1.4%. Getting rid of another 69.5 lb of U238 raises the U235 percentage to 100.

If and when data become available on the cost of U235 per lb in various concentrations, and on the corresponding pile efficiency, one can multiply 39 billion Btu by the efficiency to get the recovered heat per pound of U235, and divide this by the cost per pound of U235 to get the Btu recovered per fuel dollar for the given U235 concentration.

One can guess that the optimum percentage of U235 will be substantially above the 0.7% of natural uranium, but far below 100%.

This paper can offer no hint as to present pile temperatures, or the limiting temperatures believed to be practicable in pile operation. Official statements suggest that it may be difficult to operate at temperatures high enough for power purposes. It seems quite possible, however, that such statements may be founded on excessive ideas as to what temperatures are required commercially.

U235 COULD COMPETE AT THESE PRICES

other things being equal

Common fuel	Assumed prices	Comparable prices for Uranium 235, dollars per pound (nearest thousand)
COAL (13,000 Btu)	$6 per ton	$9,000
	$12 per ton	$18,000
	$15 per ton	$23,000
FUEL OIL (150,000 Btu gal)	2¢ per gal	$5,000
	4¢ per gal	$10,000
	8¢ per gal	$20,000
CITY GAS (500 Btu)	50¢ per 1000 cu ft	$39,000
	$1 per 1000 cu ft	$78,000
NATURAL GAS (1000 Btu)	25¢ per 1000 cu ft	$10,000
	50¢ per 1000 cu ft	$20,000
	$1 per 1000 cu ft	$40,000
GASOLINE (150,000 Btu gal)	10¢ per gal	$26,000
	20¢ per gal	$52,000
	30¢ per gal	$78,000

B U T

Note that "other things" are never equal. U235 in normal uranium form is by far the cheapest, but involves use of excessively large and inefficient "piles." The unit cost of the U235 in enriched mixtures increases with the degree of enrichment. Overall cost comparisons can be made only for a specified concentration of U235 and for apparatus suitable for that particular concentration. Possible explosion danger and need to protect personnel against radiation are other important considerations.

PROCESS STEAM MAJOR APPLICATION

Much publicity has been given to steam-electric power plants operating at 1400 psi, and at temperatures up to 900 F, or higher. Now if atomic energy is to save coal, it makes no difference whether the coal saved makes steam for electric generation or for space heating and process. The combined coal and equivalent-coal consumption of all steam electric stations in the U. S. in 1945 was just under 100,000,000 tons. In the same year medium and large industrials burned about 200,000,000 tons in power-type boilers. Most of the steam so produced was applied to heating and process at pressures of 50-psi gage, or less.

A large part of this steam never went to any prime mover.

Note that 50-psi gage saturated steam, suitable for the majority of process and heating applications, has a temperature of 298 F. Of those plants generating by-product power in turbines exhausting to process the majority can be taken care of by steam at less than 300-psi gage (422-F saturation temperature) and 700-F total steam temperature. It must be remembered that backpressure turbines require a much lower throttle temperature than condensing turbines for a given throttle pressure.

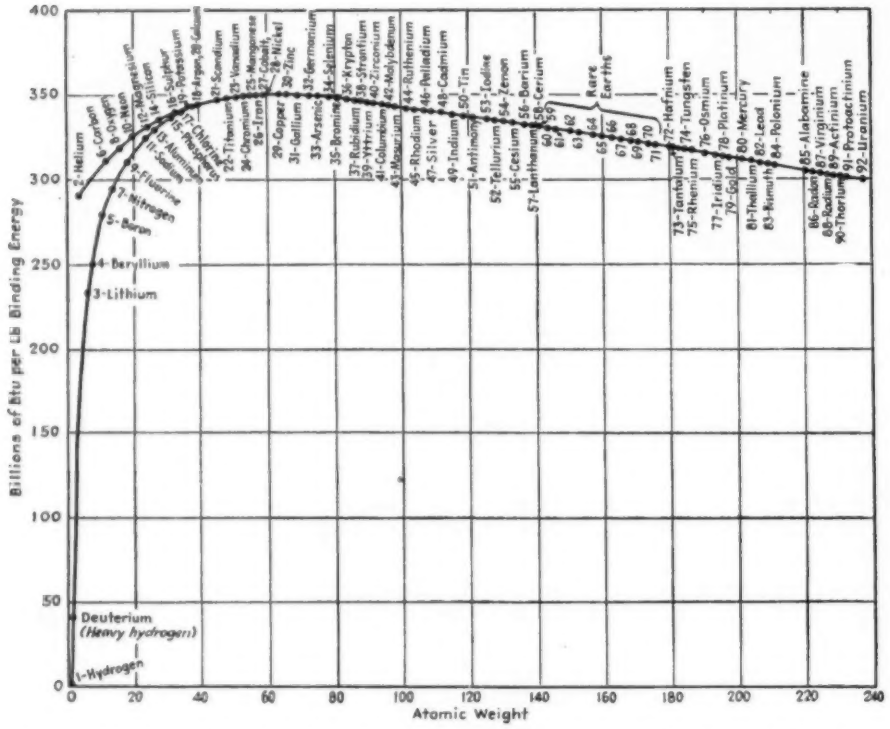
If even the 700 F should prove to be a pile limitation, the pile could presumably be used to produce the saturated steam at 422 F and then normal fuels be used in small quantity to superheat it. Electricity also has been suggested as a means of superheating in such cases, but this is obviously uneconomic.

Among the suggested causes limiting pile temperatures are corrosion or softening of the uranium or the alumnium cans, wastage of the carbon and thermal stresses in the carbon structure caused by excessively steep temperature gradients. This, in turn, suggests that the temperature limit is not precisely fixed, but rather can be raised considerably if the owner will spend more for the plant and incur more difficulty in operating it.

NO SAVING IN PLANT COST

It is obvious that the replacement of coal by uranium affects only those parts of a power plant devoted to steam generation and the handling of the fuel and ash (or other waste and byproducts). While less space would be required for the uranium storage, there is little hope that all these elements would cost less, either to build or to operate and maintain, than those of a conventional steam plant. Heavy radiation shielding and elaborate instrumentation would be needed—also highly skilled operatives and inspectors. The disposal of radioactive byproducts would be a most difficult matter. Tubes

Note: Table and first diagram in this article are taken from a report, "The Atom—New Source of Energy," which appeared in all McGraw-Hill magazines for Sept. 1945, including Power. Chart on page 78 is from Mr. Swain's paper, at Midwest Power Conference, Chicago, April 1946.



Atomic-energy chart of the 92 elements. Changing from one element to another releases the difference in binding energy if the change is upward on chart. Thus, forming helium from hydrogen in the sun yields 290 billion Btu per lb. Splitting U235 into two elements weighing about 115 yields 339 minus 300 = 39 billion Btu

or drums would still be needed to contain the water and steam under pressure.

This all leads up to the conclusion that U235 will *not* be used commercially for large-scale steam generation in stationary plants until it can compete with local coal, oil or natural gas on a dollar basis, with allowances for the relative steam-generating efficiencies (and sometimes for the temperature limitations of the atomic piles).

Table, p 77, lists prices at which U235 would break even with other fuels, "other things being equal." Remember that other things are rarely equal. On the other hand, note that this does not imply the need to purchase separated U235. It implies U235 in the concentration used.

NO ECONOMIC REVOLUTION

Without further particulars, those in the know say that U235 substantially concentrated costs many times the amounts tabulated. Past industrial history suggests that improved methods will eventually cut the cost to a fraction of present costs. Whether this will eventually bring uranium into actual competition with coal the writer has no way to determine. Take your choice of guesses that range from ten years to centuries.

One thing is certain, however; those who look for an economic revolution resulting from coal-free power are on the wrong track. Coal is a mere fraction of the delivered cost of power. For years we have had technically practicable ways to make power without coal—hydro, wind, tide and sun power. Each of the last three could produce every kilowatt-hour used in America today and thereby save *all* the coal in central power stations, but they could not do it economically. Hydro power does little better (and sometimes much worse) than run neck and neck with power from coal-fired steam-electric plants.

If we should nevertheless use atom splitting to replace the 100,000,000 tons of utility coal and the 200,000,000 tons of large-industry steam coal, all at $6 per ton, say, the saving before allowance for nuclear costs would be little more than one percent of the national income. This is no revolution except for coal men.

THINGS TO REMEMBER

Let me conclude with a few random thoughts for the record.

First note that the cost of natural uranium, even if it be raised from $2 to $10 per lb, is a negligible factor in the cost of atomic fuel. The cost resides mainly in the process of concentrating the U235, but appreciably in purifying the natural uranium.

Next I must not seem to rule out the possibility of piles that will make use of the plutonium as well as the U235 and other man-made elements, or of other natural elements such as thorium. I must also admit the theoretical possibility that we may some day get large amounts of energy by synthesizing the light elements into heavier elements, just as the sun makes its heat by turning hydrogen into helium.

For lack of space, I have said little regarding atomic-powered gas turbines. I see some promise in the direct atomic heating of helium in a closed-circuit gas turbine.

Finally, I should state my sincere belief that power-plant economics is by no means the most pressing problem in the field of nuclear energy. Number One problem is that of atomic bombs and rockets. Our first job is to contrive international arrangements that can prevent the mutual destruction of nations by atomic weapons. Meanwhile, let's maintain atomic research as the Number Two responsibility, for *nucleonics* promises developments as strange and wonderful as those that grew from the experiments of Faraday and other electrical pioneers. Nuclear-biological research alone may yield results matching in importance the future power-plant applications of atomic energy. Already the results are beginning to show in medical knowledge and treatment.

Mexican Power Expansion

The article on pp 90-91, March, "Power Development Features Mexico's Industrial Program," outlined plans of the Comision Federal de Electricidad, and said, "Of independent companies, only Mexican Light & Power is expanding, constructing a 35,000-kw extension at Mexico City's Nonalco steam plant." Information received later reveals that an expansion program totaling 42,750 kw is under way in plants owned by subsidiaries of Empresas Electricas Mexicanas, Inc, itself a subsidiary of American and Foreign Power Co, Inc.

The expansion program authorized comprises the following additions:

Merida, Yucatan	**3,000 kw, steam**
Puebla, Puebla	**9,000 kw, steam**
San Luis Potosi, S.L.P.	**9,000 kw, steam**
Saltillo, Coahuila	**2,500 kw, steam**
Aguascalientes, Aguas	**2,500 kw, steam**
Mazatlan, Sinaloa	**1,750 kw, diesel**
Torreon, Coahuila	**6,000 kw, steam**
Total	**33,750**

Addition at Merida is virtually complete; for all others equipment is ordered and construction under way.

A new 9000-kw steam plant has been authorized, to be erected at or near Celaya in Guanajuato.

MODERN PLANT SURVEY

Technical highlights of central-station and industrial-plant construction to meet postwar loads; tabulations of engineering features of steam, internal-combustion and hydro plants installed in war years and planned for current construction

AFTER FIVE YEARS' INTERRUPTION by wartime censorship, POWER here resumes publication of engineering data on new steam, internal-combustion and hydro power plants. The following pages tabulate technical highlights of typical plants installed in the war years and planned for current construction. In these cold and formal figures is the record of a stirring achievement—the provision of power for a war-production program such as the world has never known and for peaceful production that holds the hope of the future.

A brief review of the war period serves as an object lesson in skillful planning by government and by an industry long used to foresighted preparation. In 1939, our national power plant had a total capacity just under 50 million kw—38.8 million in utility plants and 10.6 million in industrials. It generated, that year, 161.3 billion kwhr, of which utilities accounted for 79.1% and industry 20.9%. Industry used 79 billion kwhr, purchasing 61.7% and generating 38.3%.

At the end of 1944, national power capacity had grown to 62.1 million kw, 49.2 million in central stations and 12.9 in industry. This war-expanded power plant generated 279.5 billion kwhr in 1944, 81.6% coming from utilities and 18.4% from industry's plants. Industrial use grew to 158.8 billion kwhr in 1944, with 70.3% purchased from central stations and 29.7% privately generated. And in 1945, total industrial use reached close to 162 billion kwhr, more than total national generation in 1939 and more than twice entire industrial use in that prewar year.

This tremendous increase in "fighting" kilowatthours, more than 100%, came from a national power plant that grew only 25%, a result of careful planning that made maximum use of existing facilities and thus made available to the Navy and merchant marine the lion's share of the production of new boilers, turbines and auxiliary power equipment.

In this coordinated program, central stations absorbed the major share of increased power demand. Thus, while *relative* generating capacity of utility and industrial plants remained virtually unchanged from 1939 through 1944, the proportion of energy purchased by industry increased considerably in relation to the amount privately generated.

Added load on central stations resulting from this program would have required a capacity increase of about 34 million kw had kilowatthours output per kilowatt of capacity remained the same as in 1939. That the job was done with an actual increase of only 10 million kw can be credited to (1) high-load-factor "around-the-clock" industrial operation that accounted for about 12.5 million kw of capacity "saved" (2) slashing margins of reserve capacity from 14 to 9 million kw for a saving of 5 million (3) cutting line losses from 18 to 8% for a further saving of close to 4 million kw (4) reduction of about 1.5 million kw in peak loads by operation of wartime and (5) a saving of 1.25 million kw through "pooling."

Facilities for manufacturing power equipment operated at a record rate of about 12 million kw per year for the four war years. Of the approximately 50 million kw of equipment built, only 10 million went to central stations and 2 million to industry, leaving 30 million for the Navy and more than 7.5 million for the merchant marine—the fruit of realistic planning and wholehearted cooperation by power engineers.

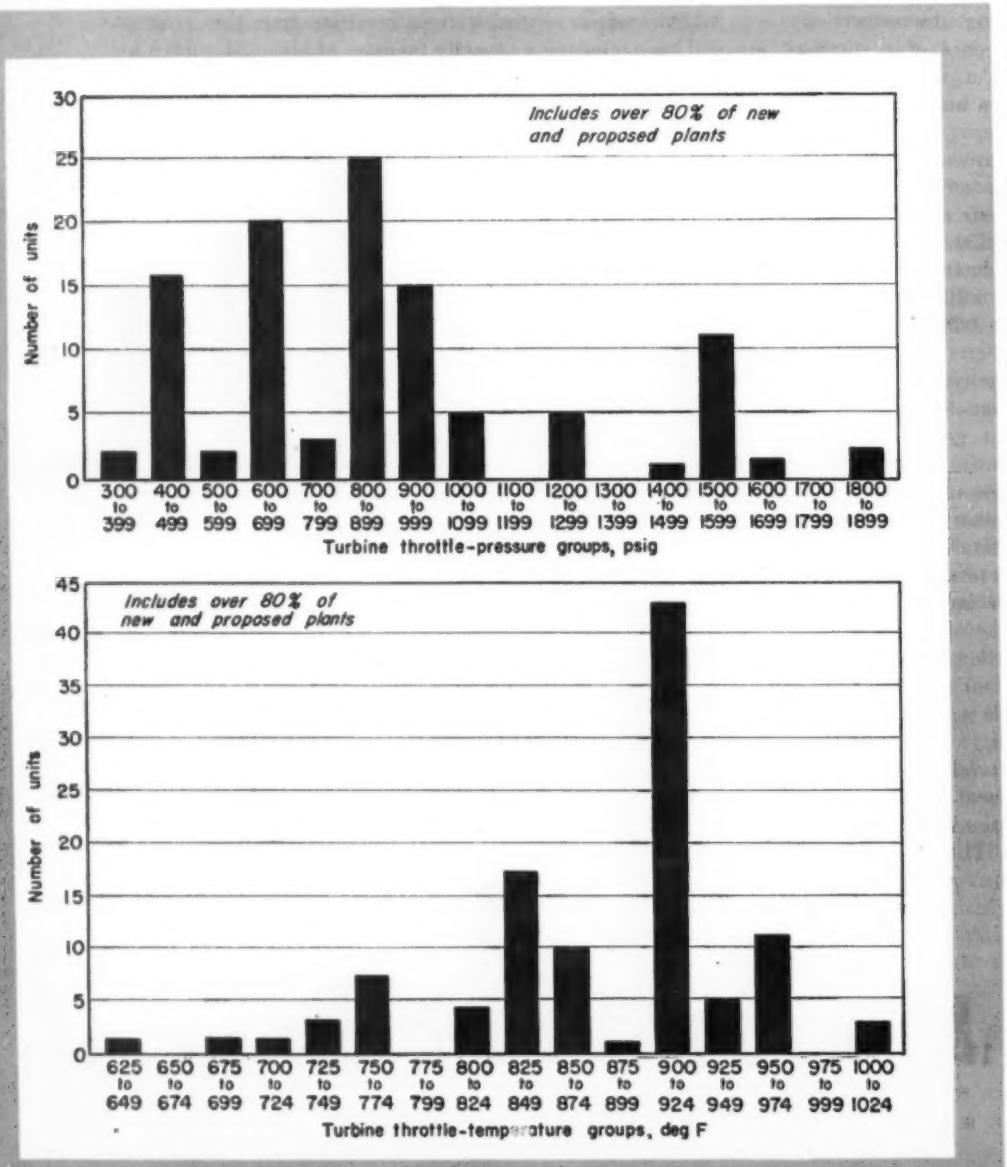
We thus enter the postwar period with a national power plant adequate to immediate demands but carrying no excess fat. As reconversion reverses many of the wartime trends, the power industry faces a necessary building program equal to or greater than any of prewar years. This added capacity will be needed to meet expected increased peak loads, to restore margins of reserve to more conservative figures, and to increase over-all efficiency by permitting retirement of obsolete equipment. As the art of power-plant design follows its evolutionary pattern we can expect the plants of the immediate future to display many of the trends discernible in the plant-by-plant survey appearing on the following pages.

Plant Tabulations Show Design Trends in Highly Active Steam-Power Construction

Utility Steam Plants. Active building programs go forward in all parts of the country even though annual kwhr output seems to be averaging about 10% less than last year. Loss of around-the-clock war-production load accounts for most of the drop in output; return to standard time and prospect of new commercial, residential and industrial loads promise to boost peak demand and hence require new generating capacity to maintain adequate margin of reserve. Some new plants will retire obsolete stations, reducing net capacity increase but improving fuel economy.

During 1945, public utilities added over 500,000 kw and municipals about 100,000, for a total of more than 600,000 kw. Scheduled additions total about 1,360,000 kw for 1946, and about 2,600,000 for 1947 and later. Thus scheduled capacity is more than half as much as installed from 1941 to 1944 inclusive, which came to about 6,600,000 kw.

Design Trends. Tables of installation data on following pages represent a composite of plants built during the war and those scheduled for near-future operation. Analysis of tabulated data, along with those on plants for which complete information is not available, show some interesting design trends. In examining these it should be kept in mind that specifications usually result from engineering economy studies which take account of numerous factors, and that at times physical conditions dictate solutions compromising with best economy.



Turbine-Generators. Fig. 1 shows that throttle pressures between 800 and 900 psi were oftenest chosen for central stations. About 60% of installations operate at throttle pressures of 600 psi and less. Most smaller units were built for pressures between 400 and 600 psi, but one 7500-kw unit operates at 900 and a 10,000-kw machine at 1500 psi.

Most prevalent throttle temperatures fall between 900 and 924 F, with the next commonest range between 825 and 849 F, Fig. 1. About 57% of the installations operate between 900 and 1000 F; three units are being built for 1000 F, Fig. 2.

Fig. 3 shows number of turbine-generator units in each capacity range. In number, smaller units predominate but, in terms of capacity, units from 51,000 kw up represent one half the total. Only three units, two toppers and one condensing unit, have no bleed points, Fig. 4. Four bleed points prove commonest. The single 6-point and the two 5-point units operate with economizers.

Considering the wave of topping installations before the war, it is interesting to note that of 86 units, reported in detail, only five are toppers. About half the new generators are hydrogen cooled; about 80% are 3600-rpm machines, and 20% 1800-rpm.

Steam Generators. Fig. 5 shows that smaller boilers predominate in number of installations; units up to 400,000 lb per hr represent about 65% of total installations. Largest boiler reported was rated at 1,000,000 lb per hr, 1600 psi and 950 F. The strong trend to one-boiler-per-turbine designs is indicated by the fact that 71 out of 103 installations follow this practice, with 20 having two boilers per turbine.

Furnace heat release forms a rough index of liberalness in design, conservative values usually indicating generous proportions and ability to burn a wider range of fuels. Fig. 6 shows that about half the boilers reported had heat releases of 23,900 Btu per cu ft per hr or less; the lowest was 14,500 and the highest 34,500.

Fig. 1, 2—Throttle pressure and temperature distribution for about 80% of central-station units installed since 1941 or planned for operation by year of 1947

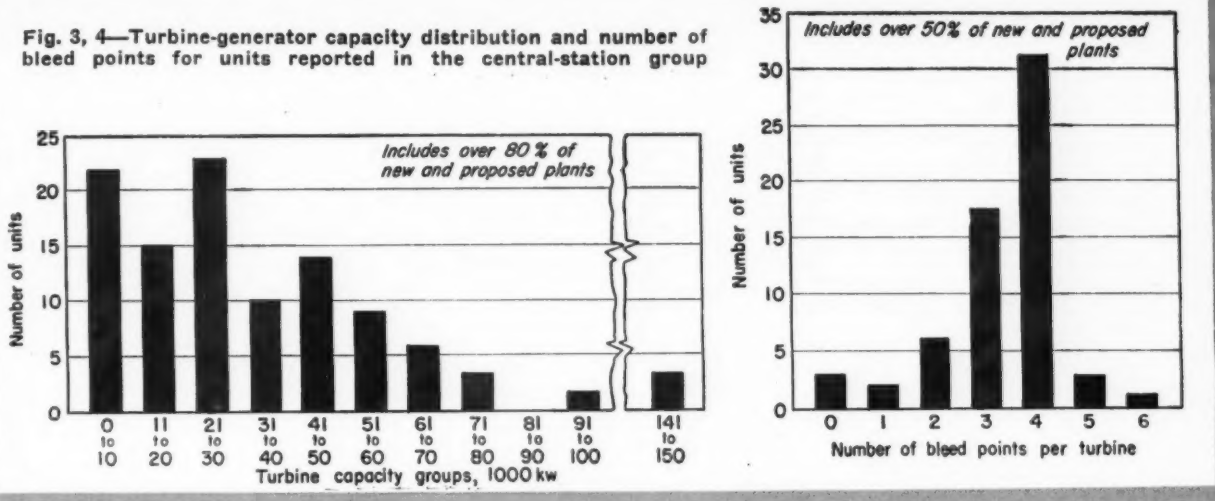


Fig. 3, 4—Turbine-generator capacity distribution and number of bleed points for units reported in the central-station group

Firing Equipment. Pulverized coal fires about half the boilers; about one third of these are slag-tap designs. Natural gas fires about 15% of the units; only one was reported as burning oil exclusively. Roughly one fourth feature combination or alternate-firing provisions. The remaining 10% of boilers reported have some form of stoker, either underfeed, spreader or traveling-grate. Some of these operate in combination with oil and gas firing.

Boiler Auxiliaries. Among 88 completely reported central-station boiler installations, three had neither economizers nor air heaters; another three had economizers only; 30 had air heaters only, and 52 had both air heaters and economizers. Air heaters were about evenly divided between tubular and regenerative types.

Forced- and induced-draft fan-drive arrangements showed considerable diversity but over two thirds had a single motor per fan and only a few percent had straight turbine drive. About half the f-d fans were controlled by vane positioning, with about 15% using damper control in conjunction with vane positioning or speed variation. Magnetic and hydraulic couplings were used in about 15% of the cases. On i-d fans, however, magnetic and hydraulic couplings accounted for about 30%, with about 20% having vane and 20% damper control.

About one third of reported boiler installations had exclusively motor-driven feed pumps and 13% had turbine drives. About 40% used both motor- and turbine-driven pumps and the rest dual drive, that is, motor and turbine in one shaft.

INDUSTRIAL STEAM PLANTS

Industrial-Plant Construction. Accurate statistics on construction of industrial steam plants remain lacking, but reports from equipment manufacturers and other indexes indicate a program of considerable magnitude compared to normal peacetime years. Addition of new capacity in industrial steam plants during the war years did not keep pace with growth in production and much of the new capacity went into plants that will not be reconverted. A substantial portion of industrial power equipment in operation at the war's beginning was obsolete, replacement having been deferred by the depression and unsettled business conditions following it. Thus industrial power engineers also face a necessary building and modernization program to meet the needs of an expanding and economy-conscious peacetime era.

Design Trends. Pressure and temperature conditions at which industrial steam plants operate continue to move upward, reflecting acceptance of the commercial practicability of such operation. It should be remembered, however, that industrial-plant operating pressure depends largely on the amount of electric energy to be generated in relation to steam production. Thus greater mechanization of industrial processes coupled with more efficient use of steam tends to change the relation between electrical and steam loads in favor of higher pressures.

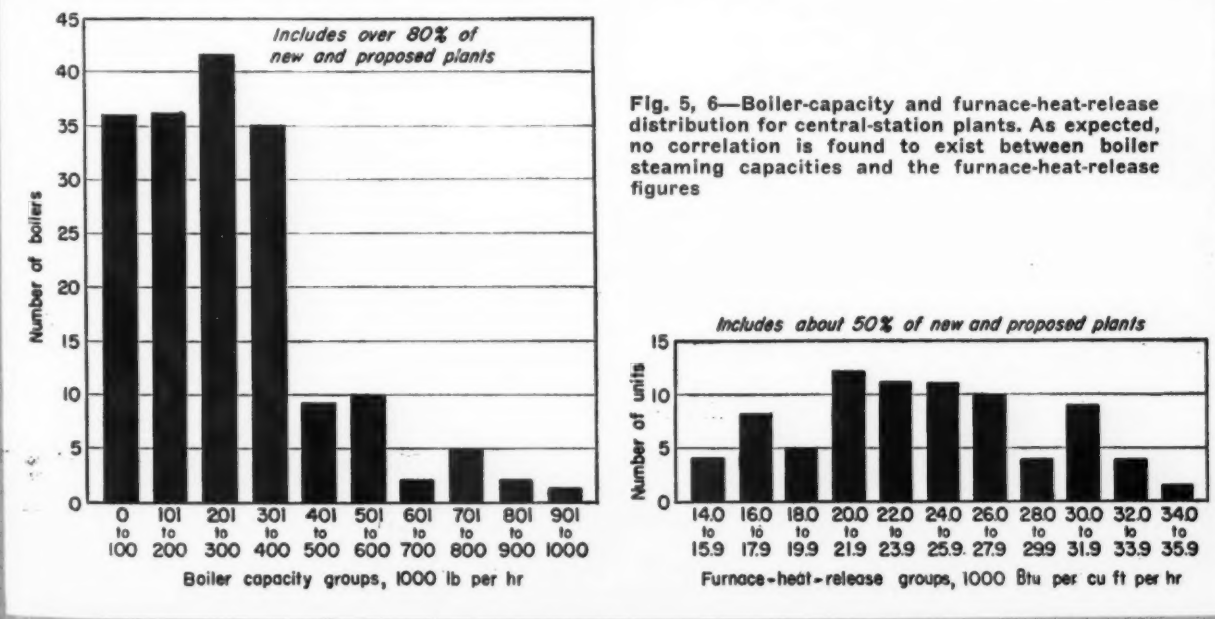


Fig. 5, 6—Boiler-capacity and furnace-heat-release distribution for central-station plants. As expected, no correlation is found to exist between boiler steaming capacities and the furnace-heat-release figures

Typical Central Stations Installed o

Compiled by B G A Skrotski
Assistant Editor

Company	Location	Plant Name	Consulting Engineers	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	BOILERS: Capacity, Each, 1000 lb per hr	BOILERS: Manufacturer	BOILERS: Waterwall Surface, 1000 sq ft	BOILERS: Heating Surface, 1000 sq ft	Furnace Volume, 1000 cu ft	Heat Release, 1000 Btu per cu ft per hr
1000 PSI AND ABOVE													
Consolidated Edison Co of N Y	Bronx, NYC, N. Y.	Sherman Creek		4-43	1600	950	1	1000	CE	10.99	12.91	54.4	22.2
				6-47	1600	950	1	1000	CE	10.99	14.10	53.7	21.9
Pacific Gas & Electric Co	Oleum, Calif	Oleum		1-41	1500	950	3	200	BW	2.55	1.55	8.0	31.9
				5-43	1500	950	3	200	BW	2.55	1.55	8.0	31.9
Columbus & So. Ohio El Co	Nr Columbus, Ohio	Walnut	United Lt & Pwr Service	6-47	1400	900	1	275	FW	5.74	0	....	20.6
Commonwealth Edison Co	Chicago, Ill	Fisk	Sargent & Lundy	12-43	1250	925	2	750	BW	11.9	5.00	46.0	19.4
Illinois Northern Utilities Co	Dixon, Ill	Dixon	Sargent & Lundy	1-46	1250	925	1	500	BW	14.74	14.74	24.4	26.2
New Orleans Pub Serv Inc	New Orleans, La	Industrial Canal	Ebasco Services	5-47	1250	950	1	400	FW	10.88	5.13	28.12	20.1[8]
Pennsylvania Power & Light Co	Hauto, Pa	Hauto	Ebasco Services	8-43	1250	925	2	340	CE	6.94	8.44	22.7	20.4
Pennsylvania Power & Light Co	Nr Sunbury, Pa	Sunbury	Ebasco Services	9-48	1250	950	4	400	FW	7.89	14.12	58.3	9.0
800 TO 999 PSI													
Columbus & So. Ohio El Co	Nr Columbus, Ohio	Pieway	United Lt & Pwr Service	10-45	900	900	1	325	FW	6.66	7.81	18.85	21.05
Wisconsin Pwr & Lt Co	Beloit, Wis	Blackhawk	Sargent & Lundy	9-46	900	900	1	275	BW	4.69	13.37	21.5	15.8
Consolidated Edison Co of N Y	Bronx, NYC, N. Y	Hell Gate		4-46	900	950	2	900	BW	23.44	.....	78.0	14.58
The Ohio Public Service Co	Warren, Ohio	Mahoningside	Electric Advisers	1941	900	850	1	350	BW	5.31	16.52	11.2	
Connecticut Lt & Pwr Co	Devon, Conn	Devon	United Engrs	10-42	875	900	2	225	CE	5.53	15.3	12.72	16.5
				1-46	875	900	2	225	CE	5.53	15.3	12.72	16.5
Gulf Power Co	Pensacola, Fla	Pensacola	Comm & So. Corp	1-45	875	860	1	230	RS	7.86	11.7	13.4	22.3
Staten Island Edison Corp	Travis, S. I., N. Y	Arthur Kill	Gilbert Assoc	2-47	875	910	2	120	FW	5.63	7.3	8.13	17.9
El Paso Electric Co	New Mexico	Rio Grande	Stone & Webster	10-46	865	900	1	185	BW	2.33	18.29	8.54	29.82
Consol Gas, El Lt & Pwr Co, Balto	Turner, Md	Riverside		12-42	850	900	1	550	BW	6.2	7.36	28.95	23.4
				4-44	850	900	1	550	BW	6.2	7.36	28.95	23.4
The Detroit Edison Co	Marysville, Mich	Marysville		1942	850	925	3	440	CE	7.10	6.58	27.83	20.0
				1947	850	925	1	440	CE	7.10	6.58	27.83	20.0
Houston Ltg & Pwr Co	Nr Houston, Texas	W Junction	Ebasco Services	6-43	850	900	1	400	RS	4.11	15.66	16.5	33.6
				12-46	850	900	1	400	RS	4.11	15.66	16.5	33.6
Illinois Power Co	Havana, Ill	Havana	Sargent & Lundy	3-47	850	900	3	285	CE	7.16	12.07	20.0	18.0
Indianapolis Pwr & Lt Co	Indianapolis, Ind	Harding St	Gibbs & Hill	3-42	850	900	1	400	CE	7.05	18.91	23.2	22.75
New Orleans Pub Serv Inc	New Orleans, La	Market St	Ebasco Services	1943	850	900	1	385	BW	3.61	19.55	17.4	30.0
Southwestern Public Serv Co	Borger, Texas	Riverview		8-47	850	900	1	330	RS	4.1	13.3	14.0	
Tennessee Valley Authority	Spring City, Tenn	Watts Bar	Chas T Main	2-42	850	900	4	600	BW	11.5	0	27.0	27.0
The Ohio Public Service Co	Shadyside, Ohio	R E Burger	Electric Advisers	1-41	850	900	2	350	BW	5.31	16.52	17.9	25.4
				3-47	850	900	2	350	BW	5.31	16.52	17.9	25.4
Iowa-Illinois Gas & El Co	Moline, Ill	Moline	United Service Co		825	825	1	100	BW	2.41	9.15	5.42	27.1
Iowa-Illinois Gas & El Co	Davenport, Iowa	Riverside	United Service Co	11-44	825	825	1	250	RS	10.5	14.5	17.5	22.8
Madison Gas & Electric Co	Madison, Wis	Blount St		5-43	825	825	1	200	FW	5.2	2.65	11.72	22.7
Southern Indiana Gas & El Co	Evansville, Ind	Ohio River	Comm & So Corp	8-43[7]	810	900	1	225	RS	8.7	8.3	13.5	22.9
600 TO 799 PSI													
Public Service Co of Ind, Inc	Terre Haute, Ind	Dresser	Sargent & Lundy	2-41	700	910	2	250	CE	4.43	6.57	13.58	24.0
				1-44	700	910	2	250	CE	4.84	6.46	13.58	24.0
				9-45	700	910	2	300	CE	5.74	7.47	.....	24.0
Sioux City Gas & Elec Co	Sioux City, Iowa	Kirk	B F Wood	1-46	700	750	1	75	FW	.....	7.86[11]	3.33	29.4
Pennsylvania Electric Co	Seward, Pa	Seward	Gilbert Assoc	11-41[9]	675	820	1	200	BW	0.87	16.32	9.5	32.8
Potomac Electric Pwr Co	Washington, D. C	Buzzard Pt	Stone & Webster	6-42	675	900	1	525	CE	7.31	17.25	25.6	25.6
				6-43	675	900	1	525	CE	7.31	17.25	25.6	25.6
				8-45	675	900	1	525	CE	7.31	17.25	25.6	25.6
Wisconsin Public Service Corp	Green Bay, Wis	Bayside	Public Ut Engr & Serv	2-43	675	900	1	312	BW	5.57	3.55	19.5	20.7
Central Illinois El & Gas Co	Rockford, Ill	Rockford	Stone & Webster	9-46	650	825	2	215[10]	FW	4.30	16.06	10.3	26.8
New York State El & Gas Corp	Bainbridge, N. Y	Jennison	Gilbert Assoc	10-45	650	825	2	200	CE	2.58	15.65	9.55	31.3
Pacific Gas & Electric Co	Eureka, Calif	Station B		2-47	650	700	1	65	BW	.....	.....	.....	.....
				.....	675	700	1	100	BW	.....	.....	.....	.....
Eastern Shore Pub Serv of Va	Vienna, Md	Vienna	United Engrs & Con	5-45	660	825	1	80	BW	1.57	7.9	4.2	.....
Dallas Pwr & Lt Co	Nr Dallas, Texas	Mountain Creek	Ebasco Services	12-45	650	825	1	300	BW	2.84	16.85	11.6	33.1
Louisville Gas & El Co	Louisville, Ky	Canal	Public Ut Engr & Serv	11-41	650	900	1	312	CE	5.77	7.6	20.31	20.16
Louisville Gas & El Co	Louisville, Ky	Paddys Run	Public Ut Engr & Serv	7-42	650	900	2	312	CE	5.77	7.6	20.31	20.16
Public Service Co of Okla	Tulsa, Okla	Tulsa	Sargent & Lundy	3-47	650	825	1	330	BW	.....	24.16[11]	26.8	14.5
Superior Water, Lt & Pwr Co	Superior, Wis	Winslow		10-42	650	825	1	125	CE	2.96	13.58	.....	27.5
Gulf States Utilities Co	Baton Rouge, La	Louisiana	Stone & Webster	12-43	600	750	1	250	BW	2.68	14.33	12.5	25.7
Interstate Pwr Co	Clinton, Iowa	Beaver Channel	Sargent & Lundy	10-46	600	825	1	175	BW	3.38	9.94	12.45	17.2
Southwestern Public Serv Co	Carlsbad, N. M	Carlsbad		3-46	600	825	1	80	BW	.....	7.77	.....	.....
Southwestern Public Serv Co	Clovis, N. M	Clovis		7-46	600	805	1	80	CE	0.94	7.31	.....	.....
400 TO 599 PSI													
Iowa-Illinois Gas & Elec Co	Fort Dodge, Iowa	Fort Dodge	H A Kleinman	.....	500	740	1	60	BW	1.72	7.29	.....	.....
Central Ohio Light & Power Co	Bluffton, Ohio	Woodcock	Sargent & Lundy	2-42	490	825	1	90	RS	3.13	10.76	5.4	23.77
Nappanee Utilities Co	Nappanee, Ind	Nappanee	Laramore & Douglass	10-46	450	700	2	25	RS	0.66	3.29	1.2	29.7
Northern States Power Co	La Crosse, Wis	French Island		3-47	450	750	1	150	EM	2.20	12.7	7.5	.....
Iowa Public Service Co	Waterloo, Iowa	Maynard	J F Pritchard	1-47	450	825	1	120	EM	1.47	9.96	6.0	.....
Fort Bend Utilities Co	Sugar Land, Texas		A H Weth	6-46	440	750	1	160	RS	1.70	13.9	6.9	34.5
Southwestern Public Serv Co	Roswell, N. M	Roswell		3-46	435	750	1	80	BW	1.15	6.22	.....	.....
Minnesota Power & Light Co	Duluth, Minn	Duluth	Ebasco Services	8-43	425	830	1	285	EC	5.1	22.75	14.9	24.5
Southwestern Public Serv Co	Guymon, Okla	Guymon		8-46	420	695	2	33	BW	0.44	4.36	.....	.....
Long Island Lighting Co	Glenwood Landing, N.Y.	Glenwood No. 2	Burns & Roe	5-42	410	750	1	550	BW	13.28[15]	.....	39.85	17.52
Long Island Lighting Co	Glenwood Landing, N.Y.	Glenwood No. 2	Ebasco Services	7-46	410	750	1	400	CE	7.84	20.68	25.5	20.1
Lynn Gas & Electric Co	Lynn, Mass		Stone & Webster	1941	400	810	1	210	BW	3.60	18.06	12.1	23.2
Missouri Utilities Co	Poplar Bluff, Mo	Poplar Bluff	Black & Veatch	7-46	400	750	1	70	BW	1.50	6.18	4.28	23.3
Southwestern Public Serv Co	Denver City, Texas	Denver City	Gibbs & Hill	8-46	400	750	1	150	CE	1.40	11.54	.....	.....
				10-47	400	750	2	150	CE	1.40	11.54	.....	.....
BELOW 400 PSI													
Central Power & Light Co	Corpus Christi, Texas	Nueces Bay	Sargent & Lundy	5-42	375	825	1	175	BW	2.09	13.8	.....	.....
				4-43	375	825	1	175	BW	2.09	13.8	.....	.....
Southwestern Public Serv Co	Amarillo, Texas	East		12-44	300	670	1	200	BW	.....	16.44	.....	.....
Public Serv Co of Okla	Hugo, Okla	Hugo		7-45	265	495	1	51	BW	.....	6.51	.....	.....
Southwestern Gas & Elec Co	Texarkana, Ark	Texarkana		7-45	250[16]	450	1	60	CE	0.63	6.3	3.4	26.0
Mount Carmel Pub Ut & Serv Co	Mt Carmel, Ill	Mt Carmel		.....	165	475	1	25	BW	.....	.....	2.0	.....
CANADA													
New Brunswick Elec Power Comm	Chatham, N. B	Chatham		10-47	600	825	1	140	FW	4.76	11.77	10.01	18.0
Nova Scotia Light & Power Co	Halifax, N. S	Halifax	Montreal Engrg Co	1942	150	500	1	35	BWG	0.96	4.28	1.40	33.4
				1944	600	800	1	110	BWG	2.33	12.50	8.65	19.7
New Brunswick Power Co	St John, N. B	Dock St	Montreal Engrg Co	1946	450	750	1	140	FW	3.97	12.88	.....	20.6
Maritime Electric Co Lmtd	Charlottetown, P. E. I	Sydney St	Montreal Engrg Co	7-46	400	750	1	60	BWG	.....	6.82[11]	2.94	27.9
Saskatchewan Power Comm	Saskatoon, Sas	Saskatoon		11-46	400	785							
Saskatchewan Power Comm	Estevan, Sas	Estevan	H A Hanright	12-46	400	750	1	80	CE	0.97	9.54	4.28	30.2

A —Air cooled
AAd —Arsenical Admiralty
Ab —Aluminum bronze
Abs —Aluminum brass
AC —Allis-Chalmers Mfg Co
As —Arsenical copper
Ad —Admiralty
BW —Babcock & Wilcox Co
BWG —Babcock-Wilcox & Goldie-McCulloch Ltd
C —Coal, bituminous
CA —Coal, anthracite
CE —Combustion Engineering Co
CP —C A Parsons Ltd
D —Dual drive
Da —Damper
DB —Dry bottom
Du —Duplex
EC —Erie City Iron Works
El —Elliott Co
EM —Edge Moor Iron Works
FW —Foster Wheeler Corp
G —Gas
GE —General Electric Co
H —Hydrogen cooled
HB —Hard-drawn brass
HF —Hogged fuel
Hy —Hydraulic coupling
L —Lignite
M —Motor drive
Mc —Magnetic coupling
MMp —Two motors per fan
MT —One motor, one turbine
Mu —Munts metal
O —Oil
P —Pulverized-fuel firing
PAd —Phosphorized Admiralty
PCk —Pulverized petroleum coke
Pl —Plate
R —Regulator

nder Construction Since September, 1941

Boiler, 1000 sq ft	Air-Heater Surface, per Boiler 1000 sq ft	Air-Heater Type	F-D FANS: Drive	F-D FANS: Air-Volume Control	I-D FANS: Drive	I-D FANS: Gas-Volume Control	Firing	FUEL: Type	FUEL: Heating Value, 1000 Btu per lb	FUEL: Ash-Fusion Temperature, F	FEED PUMPS: Drive	FEED PUMPS: Flow Control	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Backpressure, psia	TURBINES: No. of Bleed Points	Generator Cooling	CONDENSERS: Surface, 1000 sq ft	CONDENSERS: No. Water Passes	CONDENSERS: Tube Material	Total Boiler Capacity, Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
102	285.0	Re	MT[18]	S	MT[18]	S	P	C	14.7	2100	3T	S	50	3600	WE	200	1	H	.....	..	.....	2,600	195
102	260.0	Re	MT[18]	S	MT[18]	S	P	C	14.38[21]	2095	3T	S	50.0	3600	GE	215	1	H	.....	..	.....	3,600	266
105	12.54	Tu	2M	Da, V	2Mp	Da, V	P, O, G	PCk[27]	15.0	....	3Du	R	50	3600	GE	0.75	2	H	18.0	1	Abs	.....	.....
105	12.54	Tu	2M	Da, V	2Mp	Da, V	O, G	O[26]	18.5	....	1M	R	50	3600	GE	0.75	2	H	21.5	1	Abs	1,200	100
56	33.2	Re	M	Ma	M	Ma	P	C	11.5	2320	1T	S	.....	.....	.....	.....	.....	.....	.....	.....	.....	142	100
7	100.8	Tu	M	V	M	V	P	C	10.0	2350	3M, 1T	R	147	1800	AC	0.5	5	A	90.0	1	AAd	2,250[2]	323
																						1,370[3]	
67	74.3	Tu	2Mp	V	2Mp	V	P	C	10.0	2000	2T	S	50	3600	GE	0.5	4	H	45.0	2	Ad	695	65.5
90	85.0	Re	M	V	M	V	O, G	G	1.04[1]	....	3M	R	37.5	3600	GE	1.75	4	H	30.0	2	Ab	400	37.5
93	42.9	Re	M	V	M	V	P	CA	10.90[21]	2700	2M, 1T	....	31.25	3600	WE	240	0	H	.....	..	.....	1,700	101.25
80	125.8	Re	M	Da	M	.....	P	CA	12.50[21]	2600	6M	R	75.0[4]	3600	GE	0.75	5	H	42.5	2	Ad	1,600	150.0
05	61.0	Re	M	Ma	M	Ma	P	C	11.5	2320	1M, 1T	R, S	30	3600	GE	0.75	6	H	38.0	2	Ac	135	90
95	46.6	Tu	M	Hy	M	Hy	P	C	11.5	....	1M, 1T	....	25	3600	GE	0.5	4	H	25.0	2	Ad	475	35
06	167.8	Tu	T	S	T	S	P	C	13.95	2400	3T	S	65	3600	GE	295	0	H	.....	.....	.....	7,375	640
	42.2	Tu	2Mp	S, V	M	Da, V	P, O	C	12.0	2200	2T	R	30.0	3600	WE	0.5	6	A	27.0	2	Ad	1,210	87.0
	40.8	Re	M	V	M	Hy	P	C	14.0	2400	2M	....	45	3600	WE	0.5	5	H	29.0	1	Ad	.....	.....
	40.8	Re	M	V	M	Hy	P	C	14.0	2400	2M	....	45	3600	WE	0.5	5	H	29.0	1	Ad	1,725	165
	31.5	Tu	2M	V	2Mp	Da	G	G	1.0[1]	....	2M	R	22.5	3600	GE	1.0	3	H	20.35	2	Abs	230	22.5
	24.65	Tu	M	V	2Mp	V	P, O	C	14.25	2300	1M, 1Du	R	25.0	3600	WE	0.5	4	H	18.9	2	Abs	240	25
	34.0	Re	M	Da	2Mp	S, Da, V	G, O	G	1.09[1]	....	2M, 1T	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	555	49
23	66.6	Re	M	V	M	S, Da	P	C	14.15	2350	2M, 1Du	S, R	60	3600	GE	0.5	4	H	46.5	2	PAd	.....	.....
23	66.6	Re	M	V	M	S, Da	P	C	14.15	2350	2M, 1Du	S, R	60	3600	GE	0.5	4	H	46.5	2	AAd	1,100	120
14	83.60	Re	M[17]	S, Da	M	S, Da	P	C	12.5	2500	1M, 1T	S	75.0	1800	GE	0.5	4	A	47.8	1	Ad	.....	.....
14	83.60	Re	M[17]	S, Da	M	S, Da	P	C	12.5	2500	1M, 1T	S	75.0	1800	GE	0.5	4	A	47.8	1	Ad	3,140	300
7	65.0	Tu	M	V	M	V	G	G	1.04[1]	....	1M, 1T	....	37.5	3600	GE	1.75	3	H	36.0	2	Ac	.....	.....
7	65.0	Tu	M	V	M	V	G	G	1.04[1]	....	1M, 1T	....	37.5	3600	GE	1.75	3	H	36.0	2	Ac	800	80
	51.4	Tu	M	Hy	M	Hy	P	C	10.0	1900	3M, 1T	....	40.0[4]	3600	GE	0.5	4	H	30.0	1	Ac	855	80
	51.4	Re	2M	V	2M	V	P	C	11.0	2000	2M, 1Du	R	37.5	3600	GE	0.75	4	H	30.0	2	PAd	1,360	111
0	70.8	Re	M	Da	M	V	O, G	G	1.04[1]	....	2M	R	37.5	3600	GE	1.25	3	H	36.85	2	Ad	2,155	172.5
	51.5	Tu	M	Da	M	Da	G	G	1.0[1]	....	2M, 1T	R	30.0	3600	WE	0.75	4	H	32.5	2	AAd	910	55
12	90.0	Re	M[5]	V	M	Da	P	C	12.5	2500	6M	R	60.0[6]	1800	GE	0.5	4	A	40.0	1	Ad	2,400	240
	45.9	Tu	2Mp	S, V	2Mp	S, V	P, O	C	11.5	2100	1T, 1Du	S	50.0	3600	GE	0.5	6	H	46.0	2	Mu	.....	.....
	45.9	Tu	2Mp	S, V	2Mp	S, V	P, O	C	11.5	2100	2T	S	50.0	3600	GE	0.5	6	H	46.0	2	Mu	1,400	100.0
05	.....	Re	M	V	M	Hy	SS, G	C	10.1	2200	1T	S	15.0	3600	WE	0.5	2	A	13.2	2	PAd	680	50.1
	57.4	Re	M	Hy	M	Hy	P, G	C	10.1	2200	1M	....	.....	.....	.....	.....	..	.....	.....	..	.....	1,160	65.7
8	28.3	Re	M	Ma	M	Ma	P	C	11.2	2100	3M	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	760	50
6	35.4	Tu	2Mp	V	2Mp	V	P	C	10.6	2100	1M	R	20.0	3600	AC	0.5	0	H	18.25	2	Ad	1,010	72.5
78	42.2	Tu	M	V	M	V	P	C	10.6[3]	2000	2M, 1T	....	50.0	1800	GE	0.5	4	A	40.8	2	Ac	.....	.....
78	42.2	Tu	M	V	M	V	P	C	10.6[3]	2000	2M	....	50.0	1800	GE	0.5	4	A	40.8	2	Mu	.....	.....
00	49.6	Tu	M	V	2Mp	V	P	C	10.6[3]	2000	2M, 1T	....	50.0	1800	GE	0.5	4	A	40.8	2	Ac	2,580	225
75	3.62	Tu	M	V	M	S, Da	SS, O, G	C	11.8	2070	1T	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	300	8.9
31	0	...	M	V	2Mp	V	UF (468)	C	12.5	2400	1M	R	35.0	3600	WE	0.75	1	H	29.3	2	Ad	1,948	92
78	51.6	Re	M	V	M	Da, Ma	P	C	14.3	2000	2M, 1T	S	50.0	1800	GE	0.5	4	A	41.0	1	Ad	.....	.....
78	51.6	Re	M	V	M	Da, Ma	P	C	14.3	2000	2M	S	50.0	1800	GE	0.5	4	A	41.0	1	Ad	.....	.....
78	51.6	Re	M	V	M	Da, Ma	P	C	14.3	2000	2M, 1T	S	50.0	1800	GE	0.5	4	A	41.0	1	Ad	2,850	270
77	.....	Re	M	Ma	M	Ma	P	C	11.2	2100	2M, 1T	R	30.0	3600	AC	0.75	4	H	15.0	1	Ad	572	50
6	18.0	Tu	M	Da	M	Ma	SS (426)	C	10.6	1950	2M, 1T	....	20.0	3600	AC	0.75	3	A	17.35	2	Ad	1,100[10]	73
67	12.0	Tu	M	V	M	Ma	TG (672)	CA	11.5	2950	2M, 1Du	R	30.0	3600	GE	0.75	4	H	23.0	2	Ad	400	30
	.....	...	M	Da, V	M	Da, V	O, G	.....	.....	.....	3T	S	4.38	3600	GE	200	0	A	.....	..	.....	286	17.5
	.....	...	M	Da, V	M	Da, V	O,G,HF	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
88	0	...	M	Da	2Mp	S	UF (236)	C	14.2	2600	1M, 1Du	....	7.5	3600	WE	0.75	3	A	7.5	2	Ad	296	27
51	59.5	Re	M	V	M	V	G, O	G	1.0[1]	....	2M	R	30.0	3600	GE	0.75	3	H	27.1	1	Ae	700	63.5
82	56.5	Re	M	Ma	M	Ma	P	C	11.0	1900	2M, 1T	....	25.0	3600	WE	0.75	4	H	28.0	2	AAd	902.5	62
82	56.5	Re	M	Ma	M	Ma	P	C	11.0	1900	3M, 2Du	....	25.0	3600	WE	0.75	4	H	28.0	2	AAd	625	50
	63.0	Tu	M	Hy	M	Hy	P, O, G	C	11.7	2120	1M, 1T	R	30.0	3600	WE	0.75	4	H	32.5	2	....	1,255	82.9
	13.75	Tu	M	Da	M	Da	P	C, CA	14.0	2600	1M, 1T	R	12.5	3600	AC	0.5	2	A	10.9	1	Ad	155	14
	36.6	Re	1M, 1T[12]	S	1M, 1T	S, Da	G, O	G	1.0[1]	....	1T	S, R	20.0	3600	WE	2.0	2	A	11.7	2	Ae	3,050	108.5
	31.0	Tu	M	V	M	Hy	P	C	10.4	1900	1M, 1T	....	15.0	3600	WE	0.5	4	H	15.0	2	PAd	175	15
...	9.77	Re	M	V	M	Da	G	G	1.1[1]	....	2M	R	7.5	3600	GE	0.75	3	A	10.0	2	AAd	120	10
	8.03	Re	M	V	M	Da	G	G	1.05[1]	....	2M	R	5.0	3600	AC	1.0	3	A	8.0	2	AAd	120	8.0
	9.81	Re	M	Da,Hy	M	Da, Hy	P, O, G	C, CA	10.15	....	1M	S	5.0	3600	GE	0.5	3	A	7.5	2	Ad	225	15.7
...	11.2	Tu	M	Hy	M	Da, Hy	P	C	13.2	2250	1M	R	7.5	3600	WE	0.5	3	A	7.5	2	Ae	210	17.5
	2.1	Tu	M	Da	T	S	SS[13](65)	C	11.5	1900	1M, 1T	S[14]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
0	...	...	M	Da	2Mp	Da	SS (338)	C	10.4	1930	1M	....	10.0	3600	AC	0.5	4	A	7.5	1	Ad	300	20
23	8.44	Tu	M	Da	M	Da	SS (260)	C	10.6	2100	1M, 1T	R	10.0	3600	GE	1.0	4	A	10.0	1	....	600	40.0
	17.0	Tu	MT, M	V	MT, M	V	G	G	1.06[1]	....	1M	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	390	4.2
	13.55	Re	2Mp, M	Da	T, 2Mp	Da, V	G	G	1.05[1]	....	1M	R	.....	.....	.....	.....	.....	.....	.....	.....	.....	240	12
	27.8	Tu	MT, M	Da	MT, M	Da	P	C	13.5	....	1M	R	25.0	3600	WE	0.5	3	H	18.4	1	....	585	50
	1.87	Tu	MT, M	Da	MT, M	Da	G	G	1.00	....	1M, 1T	R	5.0	3600	GE	1.0	2	A	6.5	2	AAd	66	5
6	101.6	Tu	M	V	M	Ma	P, O	C	14.37	2500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	500	150
	57.6	Re	M	V	M	S, Da	P	C	14.37	2500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	900	174
	...	Re	M	S, Da	M	S, Da	P	C	14.50	2300	3M, 1T	S	10[9]	3600	GE	0.5	3	A	10.0	2	Ab	665	59.5
	8.48	Tu	M	V	2Mp	S, Da	P, O, G	C	11.90	2130	1M, 1T	R	5.0	3600	WE	1.0	3	A	6.0	2	Ad	70	5
	0	...	M	Da	M	Da	G	G	1.26[1]	....	1M, 1T	R	10.0	3600	WE	1.2	3	A	13.0	2	AAd	290	18
	0	...	M	Da	M	Da	G	G	1.26[1]	....	2M	R	15.0	3600	GE	1.0	3	H	20.0	2	AAd	590	33
	10.63	Tu	M	V	M	V	G	G	1.03[1]	....	2M, 1T	R	15.0	3600	GE	0.75	4	A	17.0	2	Abs	.....	.....
	10.63	Tu	M	V	M	V	G	G	1.03[1]	....	2M	R	15.0	3600	WE	0.75	4	A	17.0	2	Abs	530	45
	13.44	Tu	2Mp	Da	M	Da	O	O	.....	....	1M	R	.....	.....	.....	.....	.....	.....	.....	.....	.....	500	40
	.....	...	.....	.....	M	Da	O, G	G	1.03[1]	....	1T	S	.....	.....	.....	.....	.....	.....	.....	.....	.....	90	3
	.....	...	M	Da	.....	.....	G	G	1.00[1]	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	140	.....
6	.....	...	M	Da	.....	.....	UF (117)	C	11.3	....	1T	S	.....	.....	.....	.....	.....	.....	.....	.....	.....	80	4
	12.72	Pl	M	V	M	Hy	P	C	11.2	1880	1M, 1T	R	12.5	3600	CP	0.75	3	A	9.5	2	HB	140	12.5
79	0	...	T	S	T	S	TG (123)	C	13.3	2070	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
	11.31	Tu	M	V	M	Da	P	C	13.3	2070	1M, 1T	....	12.5	3600	CP	0.50	3	A	7.0	2	Ab	.....	17.5
	12.52	Tu	M	V	M	V	P	C	11.2	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	360	10
	4.95	Tu	M	Da	M	Da	O	O	18.4	....	1M, 1T	R	4.0	3600	CP	0.9	2	A	3.75	2	Ab	120	7.5
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15.0	3600	CP	0.5	2	A	13.0	2	Ad	320	39
	5.52	Pl	M	V	1M, 1T	Hy	TG (405)	L	7.2	2000	1M, 1T	R	.....	.....	.....	.....	.....	.....	.....	.....	.....	130	2.75

—Regenerative
—Riley Stoker Corp
—Speed control
—Spreader stoker
—Tag tap
—Turbine drive
—Traveling-grate stoker
—Tubular
—Underfeed stoker
—Union Iron Works

V —Vane control
Vo —Henry Vogt Machine Co
WB —William Bros Boiler & Mfg Co
WE —Westinghouse Electric Corp
WI —Wickes Boiler Co
(150) —Stoker grate area, sq ft

1—1000 Btu per cu ft
2—Capacity at 1200 psi
3—Capacity at 200 psi
4—Two units being installed
5—Two sets of one f-d fan, one i-d fan, and one motor
6—Four units being installed
7—Boiler 8/43; turbine 2/45
8—Ash-free heating value
9—Turbine 11/41, boiler 9/43
10—Four-hour rating
11—Waterwall plus blr surface
12—Plus set of f-d and i-d fans driven by one turbine
13—Continuous ash discharge
14—Variable-stroke triplex
15—Radiant-heat boiler, incl waterwall and screen surf.
16—Design pressure; operates at 175 psi
17—One motor for two fans
18—Two fans
19—Gas fired; 19.1 oil-fired
20—Oil 18,500 Btu per lb; gas 1.19 Btu[1]
21—Dry

Typical Industrials Above 200 Psi Installe

Compiled by J C McCabe
Assistant Editor

Company	Location	Consulting Engineers	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	BOILERS: Capacity, Each, 1000 lb per hr	BOILERS: Manufacturer	BOILERS: Waterwall Surface, 1000 sq ft	BOILERS: Heating Surface, 1000 sq ft	Furnace Volume, 1000 cu ft	Heat Release, 1000 Btu per cu ft per hr	
700 PSI AND ABOVE													
Utah Copper Co.	Magna, Utah	E J Franklin	....	950	900	2	350	BW	5.5	12.7	16.4	....	
Wyandotte Chemical Corp.	Wyandotte, Mich.	Burns & Roe	5-43	925	870	1	200	BW	.....	16.7[1]	9.9	24.3	DB
Firestone Tire & Rubber Co.	Memphis, Tenn.	.....	12-44	900	725	1	125	BW	1.6	12.4	5.55	29.0	DB
Pittsburgh Plate Glass Co.	New Martinsville, W. Va.	.....	7-43	850	750	3	150	BW	2.4	15.0	8.6	22.9	
Socony-Vacuum Oil Co.	Paulsboro, N. J.	.....	4-44	850	750	4	125	CE	2.27	10.5	6.9	24.5	DB
Weirton Steel Co.	Weirton, W. Va.	.....	1-47	850	800	1	325	BW	.....	20.5	16.8	.....	SC
Cities Service Refining Corp.	Lake Charles, La.	Gibbs & Hill	3-44	825	825	2	325	BW	.....	21.3	14.6	32.6	
Sinclair Rubber, Inc.	Houston, Texas	.....	10-43	750	750	6	300	CE	3.2	17.7	11.1	39.0	DB
Dairyland Power Co-op.	Genoa, Wis.	.....	....	700	850	2	50	RS	2.0	4.5	2.75	23.4	
Military Chemical Wks Inc.	Pittsburgh, Kan.	Chem Constr. Co.	1-43	700	700	5	200	RS	5.9	13.1	10.0	21.0	DB
Monsanto Chemical Co.	Springfield, Mass.	C T Main	4-42	700	750	1	80	FW	.....	7.9[1]	.....	.....	
500 TO 699 PSI													
Standard Oil Co of N. J.	Linden, N. J.	.....	4-46	685	740	1	300	RS	8.9	21.0	21.3	20.8	DB
Hammermill Paper Co.	Erie, Pa.	C T Main	10-46	675	750	2	150	CE	2.9	12.9	8.9	23.0	DB
R J Reynolds Tobacco Co.	Winston-Salem, N. C.	J E Sirrine & Co.	12-46	675	750	1	200	CE	4.5	15.4	.....	18.7	
Celanese Corp of Am.	Newark, N. J.	.....	9-45	650	650	1	60	CE	.....	.....	.....	.....	DB
Fox Paper Co.	Cincinnati, Ohio	W I Barrows	8-43	650	630	1	65	BW	.....	6.7	.....	24.2	DB
Industrial Rayon Corp.	Painesville, Ohio	.....	8-44	650	750	1	90	CE	2.6	9.2	.....	.....	DB
Shell Oil Co.	Roxana, Ill.	.....	6-42	650	750	1	125	RS	6.1	8.5	8.1	22.3	DB
			1943	650	750	2	175	FW	8.2	18.5	12.6	20.0	
			1945	650	750	1	175	BW	12.5	15.8	17.5	15.0	
Shell Oil Co.	Deer Park, Texas	.....	1946	650	750	3	250	BW	3.5	17.8	12.2	25.0	
U. S. Sugar Corp.	Clewiston, Fla.	Rust Engrg.	12-45	650	665	1	100	BW	4.0	8.9	6.4	.....	
General Aniline & Film Corp.	Binghamton, N. Y.	Baker & Spencer	8-46	625	755	3	40	CE	1.3	5.5	2.6	24.0	
Utah Oil Refining Co.	Salt Lake City, Utah	Sargent & Lundy	2-44	625	750	4	70	BW	.....	.....	.....	.....	
Humble Oil & Refining Co.	Baytown, Texas	.....	1943	620	745	2	275	CE	1.6	19.3	12.0	35.0	
			1946	620	745	1	275	CE	1.6	19.3	12.0	35.0	
St. Joe Paper Co.	Port St. Joe, Fla.	G F Hardy	....	615	715	1	100	CE	.....	.....	.....	.....	
Southland Paper Mills, Inc.	Lufkin, Texas	G F Hardy	7-47	610	750	2	175	CE	2.5	14.3	.....	29.9	
Bryant Paper Co.	Kalamazoo, Mich.	.....	1-47	600	750	2	80	RS	3.9	7.3	4.6	21.5	DB
Carbide & Carbon Chem Corp.	Texas City, Texas	Ford, Bacon & Davis	5-43	600	700	1	134	BW	.....	12.0	5.3	.....	DB
Celanese Corp of Am.	Narrows, Va.	.....	5-42	600	800	1	150	RS	4.9	10.6	8.8	22.7	DB
			11-46	600	800	1	200	RS	7.2	14.7	13.0	20.6	DB
De Laval Steam Turbine Co.	Trenton, N. J.	.....	1943	600	850	1	75	.....	2.5	2.5	3.8	23.4	
Detroit Sulphite Pulp & Paper	Detroit, Mich.	Gibbs & Hill	.....	600	740	2	90	BW	0.66	10.2	4.8	.....	
Lederle Laboratories	Pearl River, N. Y.	.....	9-46	600	750	1	80	RS	1.9	9.9	5.25	.....	
Richfield Oil Corp.	Wilmington, Calif.	R Johnson	6-44	600	625	2	250	CE	3.2	17.5	11.4	32.0	DB
Sherwin Williams Co.	Chicago, Ill.	Schmidt, Garden & Erickson	2-47	600	750	3	75	EM	1.8	7.8	.....	26.4	
The Texas Co.	Lockport, Ill.	.....	....	600	...	9	70	FW	.....	8.7[1]	3.2	27.5	
U. S. Engineers	Pryor, Okla.	E I Du Pont	7-42	600	700	6	170	CE	3.5	10.0	.....	18.0	
Gulf Oil Corp.	Port Arthur, Texas	.....	1-43	550	630	1	250	BW	2.8	16.7	11.5	28.4	DB
			6-44	550	630	1	250	BW	2.8	16.7	11.5	28.4	DB
400 TO 499 PSI													
Alton Boxboard Co.	Alton, Ill.	.....	11-44	475	740	1	100	RS	6.05	9.6	9.0	15.8	DB
Gulf States Paper Corp.	Tuscaloosa, Ala.	.....	4-46	475	650	1	100	BW	.....	.....	.....	.....	
Lee Rubber & Tire Corp.	Conshohocken, Pa.	.....	10-45	475	700	2	40	RS	1.6	5.7	2.8	24.8	DB
Federal Paper Board Co.	Bogota, N. J.	K A Lefren	1946	465	700	1	70	BW	0.2	7.7	2.8	34.0	DB
Berst-Forster-Dixfield	Plattsburgh, N. Y.	H F Hallock	8-46	460	640	1	30	BW	0	4.9	.....	.....	DB
General Aniline & Film Corp.	Grasselli, N. J.	.....	3-44	460	700	1	90	BW	1.5	7.2	4.5	22.0	DB
Bakelite Corp.	Bound Brook, N. J.	Francisco, Jacobus	11-46	450	...	1	125	BW	0.7	15.9	5.3	29.8	
Clinton Industries, Inc.	Clinton, Iowa	Sargent & Lundy	4-46	450	550	2	100	BW	1.1	10.8	4.2	32.0	
Congoleum Nairn Corp.	Marcus Hook, Pa.	.....	12-46	450	485	2	75	BW	.....	8.5	2.9	26.2	DB
Hercules Powder Co.	Bradford, Va.	N G Haag	3-43	450	750	1	175	CE	2.9	14.1	.....	26.5	
Keystone Steel & Wire Co.	Bartonville, Ill.	.....	9-46	450	750	1	150	CE	2.3	12.0	.....	.....	
Minnesota, Ontario Paper Co.	Int'l Falls, Minn.	.....	3-42	450	580	1	85	CE	2.5	8.3	4.5	.....	DB
Publicker Industries	Philadelphia, Pa.	United Engrs.	1945	450	750	6	100	RS	2.6	9.4	6.4	18.5	
Republic Rubber Co.	Youngstown, Ohio	R R Jones	1945	450	650	1	65	BW	.....	7.2	.....	.....	
Walworth Co, Inc.	Kewanee, Ill.	.....	5-45	450	...	1	60	EM	1.1	6.3	3.4	28.0	
Blandin Paper Co.	Grand Rapids, Minn.	Helmick, Edeskuty & Lutz	2-42	425	650	1	100	BW	.....	11.0[1]	5.6	24.1	DB
Calvert Distilling Co.	Relay, Md.	Smith, Hinchman & Grylls	9-46	425	600	1	75	BW	1.9	10.2	.....	17.8	DB
Magnolia Petroleum Co.	Chisholm, Texas	.....	2-43	425	675	2	175	CE	2.4	12.9	.....	35.0	
Oneida Ltd.	Sherrill, N. Y.	.....	5-46	425	....	1	70	BW	.....	7.0	1.7	43.0	
Pittsburgh Steel Co.	Monessen, Pa.	Freyn Engrg.	....	425	700	2	175	CE	4.2	19.3	.....	20.8	
Joseph E Seagram & Sons	Lawrenceburg, Ind.	Smith, Hinchman & Grylls	5-46	425	Sat	1	125	CE	3.7	11.6	9.1	18.0	DB
Socony-Vacuum Oil Co.	E. St. Louis, Ill.	.....	1943	425	...	2	80	Vo	.....	.....	.....	.....	
Paraffine Co, Inc.	Emeryville, Calif.	L S Rosener	1-47	420	630	1	100	BW	.....	.....	.....	.....	
Union Bag & Paper Corp.	Savannah, Ga.	Rust Engrg.	9-45	420	750	1	200	BW	.....	17.7	9.9	27.8	DB
American Viscose Corp.	Front Royal, Va.	T Maynz	1945	415	700	1	225	CE	3.6	11.7	.....	.....	DB
Holly Sugar Corp.	Colorado Springs, Colo.	.....	1947	410	575	1	180	RS	2.6	16.7	7.8	26.5	
Navy Department	Bremerton, Wash.	.....	9-45	405	705	1	75	EM	1.4	9.0	3.5	25.6	
U. S. Naval Gun Factory	Washington, D. C.	H A Kuljian	1-42	405	700	1	120	EM	2.0	10.0	4.1	40.0	
			1-43	405	700	1	120	EM	2.0	10.0	4.1	40.0	
Aluminum Ore Co.	Rosiclare, Ill.	W S Skeels	12-42	400	750	1	40	BW	.....	5.1	1.6	32.3	DB
Champion Intl Co.	Lawrence, Mass.	C T Main	1-47	400	600	1	70	RS	2.6	6.7	3.7	24.8	DB
Franklin Board & Paper Co.	Franklin, Ohio	.....	1-46	400	600	1	55	BW	0.3	7.4	1.9	35.0	
Kaiser Co, Inc.	Fontana, Calif.	.....	.....	400	700	1	105	BW	.....	7.3	3.1	31.9	DB
				400	700	2	165	BW	.....	12.9	6.0	31.9	DB
National Lead Co.	Sayreville, N. J.	J G White	7-46	400	637	1	250	RS	6.9	16.1	13.5	22.0	DB
Penobscot Chem Fibre Corp.	Great Works, Me.	H S Ferguson	1946	400	750	1	200	RS	5.3	12.3	10.5	25.5	DB
Rocky Mountain Arsenal	Ladora, Colo.	Whitman, Requardt & Smith — H A Kuljian	1943	400	700	2	115	BW	1.4	10.9	5.5	.....	DB
Sorg Paper Co.	Middletown, Ohio	J E Sirrine	1946	400	700	1	120	BW	.....	.....	.....	.....	DB

A —Air cooled
Ab —Aluminum bronze
AC —Allis-Chalmers Mfg Co
Ac —Arsenical copper
Ad —Admiralty
BB —Brown Boveri
BL —Black liquor
Br —Brass
BS —Bealer Boiler Co
BW —Babcock & Wilcox Co
BWG—Babcock-Wilcox & Goldie-McCulloch Ltd
C —Coal, bituminous
CA —Coal, anthracite
CB —Coke breeze
CE —Combustion Engineering Co
CP —C A Parsons Ltd
Da —Damper
DB —Dry bottom
DBR—Dominion Bridge Co
DD —Dual drive
DL —DeLaval Steam Turbine Co
Du —Duplex
EC —Erie City Iron Works
El —Elliott Co
EM —Edge Moor Iron Works
FW —Foster Wheeler Corp
G —Gas
GE —General Electric Co
H —Hydrogen cooled
HB —Hard-drawn brass
Hy —Hydraulic coupling
L —Lignite
M —Motor drive
Ma —Magnetic coupling

or Under Construction Since September, 1941

Economizer Surface per Boiler, 1000 sq ft	Air-Heater Surface per Boiler 1000 sq ft	Air-Heater Type	F-D FANS		I-D FANS		Firing	FUEL			FEED PUMPS		TURBINES					Generator Cooling	CONDENSERS			Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
			Drive	Air-Volume Control	Drive	Gas-Volume Control		Type	Heating Value, 1000 Btu per lb	Ash-Fusion Temperature, F	Drive	Flow Control	Capacity, 1000 kw	Speed, rpm	Manufacturer	Backpressure, psia	No. of Bleed Points		Surface, 1000 sq ft	No. Water Passes	Tube Material		
15.9	49.3	Tu	M	V	M	Hy, V	P	C	12.8	....	3M, T	....	50	3600	GE	.....	5	H	50	1	....	1,050	100
.....	25.0	Tu	M	V	M	Hy	P	C	13.1	2200	M	....	6.0	3600	AC	245	0	A	.....	..	....	600	14
.....	12.24	Tu	M	Da	M	Da	G	G	0.98[5]	....	T	R	....	....	....	.....	..	..	.....	..	....	250	1
3.92	12.1	Tu	T	S	T	S	UF(406)	C	12.4	2200	T	S	10.0 7.5 15.0 1.5	1800 1800 3600 3600	GE GE WE WE	0.75 0.75 190.0 45.0	0 0 0 ..	A A ..	15.0 13.1	2 2	Ad Ad	450	34
.....	17.9	Re	T	S, Da	T	S, Da	O, G	O, G	.....	.....	T	S	5.0	3600	GE	205	1	A	.....	..	....	1,100	21.7
.....	49.5	Tu	T	S	T	S	P	C	.....	2200	T	R	25.0	3600	WE	.....	..	H	.....	..	....	13,000	90
.....	34.3	Tu	M	S, V	M	S, V	G	G	1.05[5]	....	T	....	50.0	3600	GE	0.75	1	A	17.0	2	Ad	650	50
.....	36.9	Re	T	Da	T	Da	G	G	1.08[5]	....	T	S	35.0	3600	GE	1.80	1	H	.....	..	....	1,800	35
.....	8.2	Tu	M	S	M	S	P	C	.....	.....	M, T	R	4.0	3600	MS	1.0	3	A	4.0	1	Ac	180	14
.....	22.5	Tu	M	Da	M	V	P	C	11.0-12.0	2100	2M, T	S	20.0	3600	MS	1.0	1	..	.....	..	....	1,000	25
3.2	2.9	Tu	2M	V	T	.....	P	C	14.0	2300	M, T	R	....	....	....	.....	..	..	.....	..	....	.....	.....
.....	50.0	Tu	T	S	T	S	O, G	O, G	.....	.....	.....	....	.....	.....	.....	.....	..	..	.....	..	....	1,125	30
.....	20.0	Re	M	V	M	Da	P	C	12.9	2000	1M, 1T	....	7.5	3600	GE	1.0	2	A	7	2	Ad	550	18
.....	.....	Tu	M	V	M	Da	P	C	14.0	2150	T	S	....	....	....	.....	..	..	.....	..	....	520	10
.....	.....	R	M	Da	M	S	P	C	14.0	2700	1M, 1T	R	....	....	....	.....	..	..	.....	..	....	190	4.25
.....	12.0	Tu	M	Da	M	Da	P	C	13.5	2400	.....	R	....	....	....	.....	..	..	.....	..	....	65	17.5
.....	10.6	Pl	M	Da	M	Da	P	C	12.3	.....	M	R	....	....	....	.....	..	..	.....	..	....	.....	.....
.....	16.5	Tu	T	S	T	S	P, O, G	C	12.3	2100	1M, 3T	S											
.....	17.3	Tu	T	Da	T	Da	P, O, G	C	12.3	2100	1M, 3T	S	15.0	3600	GE	195	0	A	.....	..	....	1,550	20
.....	18.0	Tu	T	S	T	S	P, O, G	C	12.3	2100	1M, 3T	S											
.....	21.8	Re	T	S	T	S	G, O	O	18.0	....	2M, 3T	S	20.0	3600	AC	215	0	A	.....	..	....	1,385	25
.....	8.6	Tu	M	.....	M	.....	O, G,	O	18.3	....	1M, 1T	....	3.5	3600	GE	0.5	1	A	.....	..	....	350	7.8
1.8	0	...	M	V	M	Da	TG(200)	Ca	10.8	2900	M	R	6.6	3600	MS	1.25	1	A	2.25	2	Ad	120	6.6
.....	.....		M	S, Da	M	Da	.....	Ca	14.0	....	T	S, R	....	....	....	.....	..	..	.....	..	....	210	.....
.....	22.9	Re	T	S, Da	T	S, Da	G	G	1.2[5]	....	2T	S	7.5	3600	GE	170	..	..	.....	..	....	2,485	41.5
.....	22.9	Re	T	S, Da	T	S	G	G	1.2[5]	....	DD	S											
.....	.....	Tu	M	V, Hy	M	Da	O	O	.....	.....	2M, 1T	R	12.0	3600	GE	15.0	2	A	.....	2	Ad	464	12
.....	20.1	Tu	M	Da	M	Da	G	G	1.05[5]	.....	1M, 1T	R	10.0	3600	GE	1.5	2	A	12.0	2	Ac	650	32
.....	11.0	Tu	T	S	T	S, Da	P	C	11.5	2100	2M, T	R	5.0	3600	GE	1.0	2	A	4.0	2	Ad	240	10
.....	.....	...	T	Da	T	Da	G	G	1.0[5]	.....	T	R	4.3	3600	GE	70	..	A	.....	..	....	402	8.75
.....	17.2	Re	M	V	M	V	P	C	14.0	2300	1M, 2T	R	7.0	3600	GE	1.5	2	A	3.68	2	Ad	650	21
.....	23.8	Re	M	V	M	V	P	C	14.0	2300	1M, 2T	R											
2.2	7.0	Tu	M, T	S	M, T	S	UF(219.5)	C	14.0	.....	T	R	1.25	5680	DL	1.5	1	A	.....	2	....	100	3
0.79	4.4	Tu	T	Da	T	Da	UF(255)	C	12.8	2100	2M, 1T	R	4.0	3600	AC	1.04	1	A	.....	..	....	270	9
.....	11.0	Tu	M, T	V	T	S, V	SS, O	C,Ca,O	.....	....	1M, 1T	R	....	....	....	.....	..	..	.....	..	....	.....	.....
.....	17.4	Pl	T	S, Da	T	S, Da	O, G	O	18.5	....	T	R	....	....	....	.....	..	..	.....	..	....	770	.....
3.5	.....	...	M	S	T	S	UF(308)	CB	10.4	2150	1M, 2T	R	....	....	....	.....	..	..	.....	..	....	.....	.....
.....	0	...	T	S	T	S	G, O	G	1.6[5]	....	M, T	S, R	....	....	....	.....	..	..	.....	..	....	630	.....
.....	34.3	Tu	T	S, V	T	S, V	P	C	11.0	....	T	S	10.0 10.0	3600 3600	GE GE	2.5 50.0	2 ..	A ..	.....	2 ..	....	1,020	20
.....	15.8	Tu	M	Da	M	Da	G	G	1.05[5]	....	T	R	10.0	3600	AC	145	0	A	.....	..	....	950	20
.....	15.8	Tu	T	Da	T	Da	G	G	1.05[5]	....	T	R											
.....	17.0	Tu	M	V	M	Da	P	C	10.0	2050	T	S	1.5 9.0	3600 3600	WE WE	1.0 47.0	2 2	A ..	3	1 ..	Ad	350	10.9
.....	.....	...	M	Da	M	Da	BL	BL	.....	.....	1M, 1T	....	7.5	3600	WE	40.0	1	A	.....	..	....	450	16.25
.....	2.8	Tu	M, T	Da	M, T	Da	P	C	14.5	2600	1M, 1T	R	....	....	....	.....	..	..	.....	..	....	205	.....
1.5	4.2	Pl	M	Da	M	Da	TG(318)	Ca	11.2	2800	1M, 1T	S, R	1.0	3600	GE	165	..	A	.....	..	....	145	1.7
1.9	0	...	.....	S, Da	.....	Da	P	C	14.2	2800	.....	R	....	....	....	.....	..	..	.....	..	....	120	5
.....	9.9	Tu	M	Ma	M	Ma	P	C	13.4	2360	T	R	....	....	....	.....	..	..	.....	..	....	270	4.5
.....	.....	...	M, T	V	.....	Da	UF(302)	C	12.9	2150	M, T	R	....	....	....	.....	..	..	.....	..	....	263	.....
1.6	7.5	Tu	M, T	V	M, T	S, Hy	SS(267)	C	10.1	1900	T	R	3.5	3600	AC	165	0	A	.....	..	....	670	12
.....	.....	Tu	M	Da	M	Da	P	C	13.5	2200	M, 2Du	R	....	....	....	.....	..	..	.....	..	....	185	.....
.....	19.6	Tu	M, T	V	M, T	V	P	C	13.0	2530	Du	R	6.0	3600	AC	1.25	1	A	.....	..	....	875	24
6.1	.....	...	2Mp	Da	2Mp	Da	SS(440)	C	9.95	....	1M, 1T	R	....	....	....	.....	..	..	.....	..	....	390	17
.....	7.4	Tu	M	Da	M	Ma	P	C	14.2	....	M	R	7.5	3600	GE	0.75	2	A	8.5	2	Ad	700	18
.....	9.0	...	M	.....	.....	.....	.....	C	13.0	2400	.....	....	....	....	....	.....	..	..	.....	..	....	1,260	.....
.....	.....	...	T	Da	T	S	TG(180)	C	13.5	2200	1M, 1T	R	2.25	3600	GE	4.0	1	..	.....	..	....	.....	.....
2.6	.....	...	M, T	Da	M, T	Da	SS(145)	C	10.5	2300	T	R	....	....	....	.....	..	..	.....	..	....	.....	.....
.....	9.9	Tu	M	Da, Ma	M	Da, Ma	P	C	13.8	2400	M, T	S, R	4.0	3600	AC	1.0	2	A	3.8	2	Ad	215	9.5
.....	9.8	Re	M	Da	M	Da	P	C	13.6	....	1M, 1T	R	....	....	....	.....	..	..	.....	..	....	210	0.2
.....	12.9	Re	T	Da	T	Da	G	G	.....	.....	T	R	7.5	3600	GE	0.75	2	A	5.5	2	Ad	1,410	25
.....	28.6	Tu	M	Da	M	Da	SS(129)	C	14.3	2600	.....	.....	....	....	....	.....	..	..	.....	..	....	130	16
.....	15.1	Re	T	.....	T	.....	P	C	12.5	.....	T	....	....	....	....	.....	..	..	.....	..	....	900	.....
.....	30.3	Pl	M	Da	M	Da	P	C	11.0	2100	1M, 1T	....	....	....	....	.....	..	..	.....	..	....	335	1.4
.....	.....	...	T	S	T	S	O, G	O, G	.....	....	1M, 1T	R	....	....	....	.....	..	..	.....	..	....	280	.....
.....	.....	Tu	M, T	V	M, T	V, Da	G	G	1.03[5]	....	T	R	....	....	....	.....	..	..	.....	..	....	310	2.5
.....	.....	Tu	M	Da	M	Da	P	C	13.2	2400	1M, 1T	S	7.5	3600	GE	1.0	2	A	10.0	1	Ac	1,200	28.5
.....	25.7	Tu	M, T	S	M, T	S	P	C	11.5	2600	T	S, R	7.5	3600	GE	40.0	..	A	.....	..	....	900	33
.....	.....	...	M	V	M	V	O	O	18.5	....	2M, 1T	R	3	3600	GE	64.7	0	A	.....	..	....	180	3
.....	9.4	Tu	M	V	M	V	O	O	18.5	....	1M, 1T	R	....	....	....	.....	..	..	.....	..	....	400	.....
7.6	0	...	T	S	M	V	UF(293)	C	14.0	2650	1M, 1T	R	....	....	....	.....	..	..	.....	..	....	.....	.....
7.6	0	...	T	S	M	V	UF(293)	C	14.0	2650	1M, 1T	R	....	....	....	.....	..	..	.....	..	....	.....	.....
.....	.....	...	M	Da	.....	Da	TG(137)	C	10.6	2000	1M, 1T	S	1.67	3600	EL	5.0	0	A	.....	..	....	89	1.67
.....	6.6	Tu	M	S, V	M	S, V	P	C	13.8	2400	M, T	S	....	....	....	.....	..	..	.....	..	....	150	5
1.9	.....	...	M	V	M	Da	TG(145)	C	12.5	2700	.....	R	....	....	....	.....	..	..	.....	..	....	110	1.5
.....	11.6	Tu	M, T	S, Da	M, T	S, Da	O, G	O, G	.....	....	T	R											
.....	11.7	Tu	M, T	S, Da	M, T	S, Da	O, G	O, G	.....	....	T	R	....	....	....	.....	..	..	.....	..	....	475	.....
.....	27.5	Tu	M, T	S	M, T	S	P	C	13.4	2300	M	R	5.0	3600	WE	1.25	2	A	5.5	2	....	500	11
.....	29.0	Tu	M	V	M	V	P	C	14.8	2200	1M, 1T	R	3.5	3600	GE	165.0	0	A	.....	..	....	.....	.....
.....	9.2	Pl	M	Da	M	Da	SS(297)	C	9.6	2500	M	R	7.5	3600	WE	1.0	2	A	7.6	2	....	230	7.5
.....	.....	...	M	.....	M	Ma	P	C	12.5	2200	M	R	....	....	....	.....	..	..	.....	..	....	.....	.....

MS —Moore Steam Turbine Div
2Mp —Two motors per fan
MT —One motor, one turbine per fan
Mu —Muntz metal
O —Oil
P —Pulverized-fuel firing
Pl —Plate
R —Regulator
Re —Regenerative

RS —Riley Stoker Corp
S —Speed control
Si —Simplex
SS —Spreader stoker
ST —Slag tap
T —Turbine drive
TH —Terry Steam Turbine Co.
TG —Traveling-grate stoker

Tu —Tubular
UF —Underfeed stoker
UI —Union Iron Works
V —Vane control
VK —Vickers Keeler Boiler Co
Vo —Henry Vogt Machine Co
WE —Westinghouse Electric Corp
WI —Wickes Boiler Co

(180)—Stoker grate area, sq ft
1 —Includes water wall
2 —Continuous ash discharge
3 —Both fans on one shaft
4 —Subbituminous
5 —1000 Btu per 1000 cu ft
6 —High-pressure boilers for testing purpose

Typical Industrials Above 200 psi

Compiled by J C McCabe
Assistant Editor

Company	Location	Consulting Engineers	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	Capacity, Each, 1000 lb per hr	Manufacturer	Waterwall Surface, 1000 sq ft	Heating Surface, 1000 sq ft	Furnace Volume, 1000 cu ft	Heat Release, 1000 Btu per cu ft per hr	Furnace Bottom
201 TO 399 PSI													
N. Y., N. H. & Hartford RR	Cos Cob, Conn	Gibbs & Hill	1-44	375	600	1	180	RS	3.8	12.2	8.2	28.7	DB
American Enka Corp	Enka, N. C		11-44	350	725	1	105	BW	.....	9.1	6.9	21.6	DB
Colo. Fuel & Iron Corp	Pueblo, Colo	United Engrs	4-44	330	750	1	150	RS	4.5	14.9	13.0	16.8	...
Emery Industries Inc	Cincinnati, Ohio	A M Kinney	.....	300	Sat	1	52	BW	6.5	5.5	3.3	.....	DB
Republic Steel Corp	Chicago, Ill	United Engrs	.....	300	650	3	100	BW	7.8	5.7	5.3	25.7	DB
St. Regis Paper Co	Trenton, N. J	Gruenwald & Niemits	9-46	300	Sat	1	100	Vo	0.9	11.6	.....	.....	DB
Savannah Sugar Ref Corp	Port Wentworth, Ga		6-45	300	600	1	60	RS	2.0	5.8	2.9	24.8	ST
Owens-Corning Fibreglas	Newark, Ohio		3-46	270	600	1	40	RS	1.8	3.5	3.0	.....	DB
Amalgamated Sugar Co	Nampa, Idaho	A J Forbes	1942	250	385	2	85	BW	.....	13.1	.....	.....	DB
American Molasses Co	Brooklyn, N. Y	J G White	12-45	250	585	1	80	BW	.....	9.7	.....	22.8	...
Atlantic Seaboard Cork	Boldman, Ky		3-46	250	500	1	90	BW	.....	.....	.....	.....	...
Atlas Powder	Newcastle, Del		8-46	250	Sat	2	30	EM	0.4	4.6	.....	30.0	...
Cudahy Bros Co	Cudahy, Wis	B Bugbe	.....	250	550	2	25	WI	.....	.....	.....	.....	...
				250	550	1	35	EM	.....	.....	.....	.....	...
				250	550	1	50	EM	.....	.....	.....	.....	...
Diamond Wire & Cable Co	Chicago Hts., Ill		2-45	250	Sat	1	5	BW	.....	1.3	0.3	21.0	...
Gleason Works	Rochester, N. Y	Beman & Candee	10-43	250	500	3	25	BW	.....	.....	.....	.....	...
Glenlyon Print Works	Phillipsdale, R. I	Westcott & Mapes	11-46	250	550	1	60	RS	3.1	5.8	4.3	17.6	ST
Goodyear Tire & Rubber Co	Gadsden, Ala		1-46	250	Sat	2	60	BW	1.2	5.9	.....	.....	...
Lake Placid Club Co	Lake Placid, N. Y	Riley Corp	2-46	250	556	1	30	RS	0.7	2.4	1.05	.....	...
Mathieson Alkali Works	Lake Charles, La		7-44	250	610	1	260	BW	.....	25.0	.....	.....	...
Pittsburgh Coke & Chem Co	Neville Island, Pa		.....	250	500	2	75	CE	.....	10.4	.....	.....	DB
Servel, Inc	Evansville, Ind		2-43	250	Sat	1	50	BW	0.5	6.8	.....	.....	...
Winslow Bros & Smith	Norwood, Mass		12-42	250	...	1	50	CE	.....	5.7	.....	.....	DB
Worcester Cold Storage	Worcester, Mass		5-46	250	...	2	23	CE	0	3.6	1.12	.....	DB
Raybestos-Manhattan	Manheim, Pa		1-46	240	400	1	46	EM	0.3	6.7	1.7	.....	...
General Electric Co	Syracuse, N. Y		10-42	235	436	3	60	RS	1.8	6.6	.....	.....	...
Boston Cons Gas Co	Everett, Mass		12-43	230	500	2	62.5	BW	1.25	6.7	3.2	28.0	DB
Atlas Powder Co	Stamford, Conn		9-46	225	500	1	60	CE	1.3	7.4	.....	.....	...
Bath Iron Works Corp	Bath, Me		2-45	225	...	2	30	BW	.....	.....	.....	.....	...
Cons Citrus Products	Tampa, Fla	N C Ebaugh	4-46	225	390	1	28	BW	0.7	3.0	.....	.....	DB
Cons Vultee Aircraft	Ft. Worth, Texas	Austin Co	2-42	225	...	4	100	RS	2.1	.....	3.8	38.8	...
Kohler Co	Kohler, Wis		3-46	225	397	1	100	WI	1.1	9.7	2.9	24.3	DB
Lake Shore Tire & Rubber Co	Des Moines, Ia	E Patera	.....	225	396	2	15	BW	.....	4.3	1.1	.....	DB
Ware Shoals Mfg Co	Ware Shoals, S. C	J E Sirrine	12-42	225	520	1	80	BW	.....	8.9	.....	.....	DB
Foster Wheeler Corp	Dansville, N. Y		12-43	220	441	2	50	FW	1.5	3.6	2.2	23.0	DB
Standard Oil Co of N. J	Baton Rouge, La	E B Badger	4-43	220	520	5	150	RS	2.7	14.9	7.4	29.2	...
West Va. Coal & Coke	Chauncey, W. Va		4-45	210	...	1	75	EC	1.07	11.2	4.6	.....	...
TESTING BOILERS*													
Kieley & Mueller, Inc	North Bergen, N. J		1943	2000	900	1	1.5	BS	.....	0.086[1]	0.004	730	...
Joshua Hendy Iron Wks	Sunnyvale, Calif		1943	1500	900	1	15	BS	.....	0.567[1]	0.018	1260	...
Westinghouse Electric Corp	Emeryville, Calif		1943	2000	900	1	1.5	BS	.....	0.086[1]	0.004	730	...
CANADA													
500 PSI AND ABOVE													
Marathon Paper Mills Co	Marathon, Ont	Stone & Webster	6-46	675	715	2	125	CE	.....	.....	.....	.....	...
			6-46	675	715	2	65	BW	.....	.....	.....	.....	...
Bathurst Pwr & Paper Co	Bathurst, N. B		1945	640	730	1	175	BWG	5.3	19.5	.....	15.7	DB
Alliance Paper Mills	Merritton, Ont		6-46	620	760	1	75	CE	1.6	6.98	.....	27.1	...
Fraser Co, Ltd	Edmundston, N. B	H G Acres	8-46	600	700	2	100	CE	1.77	9.0	.....	23.6	DB
Gaspesia Sulphite, Ltd	Chandler, Que		1945	600	710	2	65	CE	1.76	7.0	.....	22.3	...
Dominion Steel & Coal Corp	Sydney, N. S		1941	500	750	1	185	BWG	2.6	14.6	10.4	21.5	DB
400 TO 499 PSI													
Atlantic Sugar Ref Ltd	St. John, N. B	H G Acres	7-46	450	600	2	60	BWG	1.6	6.8	2.7	28.7	DB
Dominion Oilcloth & Linoleum Co	Montreal, Que		1944	450	...	1	60	BWG	.....	6.4[1]	2.6	13.3	DB
Imperial Oil Ltd	Montreal East, Que		2-46	450	650	1	50	BWG	.....	5.2	1.9	29.3	...
Shell Oil Co of Canada	Montreal East, Que		12-43	450	601	1	75	FW	2.2	6.3	4.2	.....	...
Polymer Corp, Ltd	Sarnia, Ont	H G Acres	.....	430	650	5	308	BWG	8.9	19.2	25.7	14.5	DB
201 TO 399 PSI													
Barrett Co, Ltd	Joliette, Que	Atwoods, Ltd	1946	250	Sat	1	40	DBR	.....	5.4	.....	.....	...
B F Goodrich Rubber Co	Kitchener, Ont		4-46	250	378	1	36	FW	1.3	3.7	1.9	21.4	DB
Canadian Industries, Ltd	Kingston, Ont		.....	250	406	3	17	VK	0.5	2.7	0.5	.....	DB
Granby Cons, M S & Pwr	Princeton, B. C	A R Yuill	.....	250	600	2	80	CE	2.0	8.2	.....	24.3	DB
James MacLaren, Ltd	Masson, Que	H S Ferguson	1941	250	Sat	2	90	CE	2.6	9.6	11.6	18.7	DB
Maritime Industries, Ltd	Nappan, N. S	H G Acres	1946	250	556	2	15	DBR	.....	2.5	.....	.....	...
Moirs, Ltd	Halifax, N. S	Montreal Engr	1945	250	Sat	1	12	FW	0.4	1.2	0.46	35.5	...
Northern Elec Co, Ltd	Montreal, Que		9-45	250	406	1	3.5	BWG	.....	1.0	0.32	.....	...
Quebec Sugar Ref Co	St Hilaire, Que	F Burnam	.....	250	406	3	40	FW	0.9	6.4	2.3	.....	DB
Eastern Car Co, Ltd	Trenton, N. S		12-41	234	600	1	65	CE	1.9	7.7	5.5	.....	...
Firestone Tire & Rubber Co	Hamilton, Ont		3-42	225	Sat	2	30	BW	.....	3.9	1.0	.....	...
Maple Leaf Milling Co	Port Colborne, Ont	MacDonald Engrg	5-45	210	...	2	15	BWG	.....	2.5	.....	.....	...

Typical Municipal Plants Installed or

UNITED STATES													
City of Glendale	Glendale, Calif	Carl A Heinze	5-47	600	825	1	200	CE	2.59	12.43	7.15	34.4	...
City of Springfield	Springfield, Minn	Chas Foster	7-46	480	750	1	35	WB	.....	4.79[1]	.....	25.2	...
City Water & Light Dept	Dyersberg, Tenn		.....	450	700	1	90	BW	0.58	9.87	.....	.....	...
McPherson Water & Elec Dept	McPherson, Kansas	Larrimore & Douglass	9-46	450	750	1	100	RS	1.63	5.15	.....	25.0	...
Municipal Utilities	Marshall, Mo	Henrice Lowery	8-42	450	750	1	24	CE	.....	.....	.....	.....	...
		Henrice Lowery	8-42	450	750	1	40	CE	.....	.....	.....	.....	...
		Black & Veatch	1-47	450	750	1	60	CE	1.94	6.40	3.62	20.6	DB
Public Utilities Comm	New Ulm, Minn	R D Thomas	9-42	450	750	1	70	UI	0.78	7.65	4.25	.....	...
Peru Elec Lt & Water Depts	Peru, Ind		6-46	450	...	2	130	CE, BW	.....	.....	.....	.....	...
Richland Center Mun Util	Richland Center, Wis	R D Thomas & Asso	11-46	430	730	1	45	BW	0.75	6.40	2.50	27.7	...
Public Service Commission	Yazoo City, Miss	J B Williams	1-47	425	750	1	60	RS	0.64	7.74	3.60	24.5	...
City of Monroe	Monroe, La	Burns & McDonnell	2-46	415	750	1	80	BW	1.30	8.34	4.09	.....	...
City of Frankfort	Frankfort, Ind	Froehlich & Emery	6-42	400	725	1	110	BW	1.17	12.29	.....	.....	...
City of Gainesville	Gainesville, Fla	Robert & Co	4-47	400	750	1	70	BW	.....	7.33[1]	.....	35.0	...
Municipal Light Plant	Martins Ferry, Ohio	Rust Eng	1943	400	750	2	50	BW	1.11	5.45	.....	.....	DB
Montpelier Mun Utilities	Montpelier, Ohio	J M Hoover	7-46	400	700	1	40	Vo	0.41	4.78	.....	.....	...
City of Thomasville	Thomasville, Ga		11-46	400	725	1	50	BW	.....	6.44	.....	27.0	DB
CANADA													
City of Regina	Regina, Sas		.....	450	825	1	100	FW	3.20	9.02	6.86	21.0	...
City of Edmonton	Edmonton, Alberta		1942	415	750	1	155	BWG	0.68	21.78	7.10	33.4	...
Corp of the City of Medicine Hat	Medicine Hat, Alb		6-45	275	550	1	70	FW	1.32	7.34	3.38	31.2	...
Truro Electric Comm	Truro, N. S		1942	180	540	1	30	BWG	.....	5.24	.....	.....	...

Continued From Preceding Two Pages

Economizer Surface per Boiler, 1000 sq ft	Air-Heater Surface, per Boiler 1000 sq ft	Air-Heater Type	F-D FANS: Drive	F-D FANS: Air-Volume Control	I-D FANS: Drive	I-D FANS: Gas-Volume Control	Firing	FUEL: Type	FUEL: Heating Value, 1000 Btu per lb	FUEL: Ash-Fusion Temperature, F	FEED PUMPS: Drive	FEED PUMPS: Flow Control	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Backpressure, psia	TURBINES: No. of Bleed Points	Generator Cooling	CONDENSERS: Surface, 1000 sq ft	CONDENSERS: No. Water Passes	CONDENSERS: Tube Material	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
.....	8.5	Tu	T	S, Da	T	S, Da	P	C	13.8	2800	T	S, R	.....	.....	.....	.....	..	..	.....	..	.....	600	36
.....	11.0	Tu	M, T	S, Da	M, T	S, Da	P	C	14.0	2650	T	S, R	.....	.....	.....	.....	..	..	.....	..	.....	450	13
.....	17.0	Tu	M	Hy	M	.....	G	G	0.86	....	1M, 1T	R	.....	.....	.....	.....	..	..	.....	..	.....	1146	30
.....	3.8	Pl	M	S, Da	M	Da	P	C	14.4	2902	2M, 1T	S, R	0.2	1800	WE	9.0	..	A	.....	..	.....	100	.....
.....	11.9	Tu	T	S	T	S	P	C	10.5	2100	T	S	.....	.....	.....	.....	..	..	.....	..	.....	380	.....
.....	7.3	Tu	M	S, Da	M	S, Da	P	C	12.3	2600	1M, 1T	S	.....	.....	.....	.....	..	..	.....	..	.....	150	.....
.....	4.7	Tu	T	S, Da	T	S, Da	O, P	O	18.5	....	T	S	1.0	3600	GE	25.0	1	A	.....	..	.....	209	4
.....	3.1	Tu	T	S	T	.....	P	C	12.2	2050	1M, 1T	R	.....	.....	.....	.....	..	..	.....	..	.....	145	0.5
.....	.....	...	M	Da	.....	Da	P	C	12.6	2200	1M, 4T	R	2.25	3600	MS	20.0	..	..	.....	..	.....	170	2.25
.....	11.9	Tu	M	Da, V	M	.....	P	C	14.5	2920	2M, 1T	S	.....	.....	.....	.....	..	..	.....	..	.....	150	2.5
.....	.....	Tu	T	S, Da	T	S	P	C	13.0	2600	M	R	.....	.....	.....	.....	..	..	.....	..	.....	210	.....
.....	.....	...	M	V	.....	.....	TG(144)	Ca	11.5	2500	T	S	.....	.....	.....	.....	..	..	.....	..	.....	60	.....
.....	.....	Tu	M	Da	M	Da	UF	C	11.3	2100	Si	S	1	3600	MI	3.0	1	A	.....	..	Ad	135	2.4
.....	.....	Tu	M	Da	M	Da	UF																
.....	.....	Tu	M	Da	M	Da	SS																
.....	.....	...	M	V	M	Da	TG(35)	C	11.9	....	2Du	R	.....	.....	.....	.....	..	..	.....	..	.....	5	.....
.....	.....	...	M, T	Da	.....	.....	UF(76)	C	13.5	2600	1M, 1T	R	2	3600	MS	1.0	1	A	36.4	2	Br	75	2
.....	6.5	Tu	M	V	T	V	P, O	C, O	.....	.....	2T	R	0.8	....	TE	15.0	..	A	.....	..	.....	180	2.3
.....	.....	Tu	M	Da	M	Da	P	C	12.7	....	1M, 1T	R	.....	.....	.....	.....	..	..	.....	..	.....	188	.....
0.7	.....	...	M	.....	.....	.....	UF(94)	C	14.6	2900	1M, 1Du	...	.....	.....	.....	.....	..	..	.....	..	.....	50	0.55
3.5	.....	...	M, T	Da	M, T	Da	G	G	1.15	....	2T	R	.....	.....	.....	.....	..	..	.....	..	.....	260	.....
.....	.....	Tu	M	Da	T	Da	P	C	13.2	....	T	S	.....	.....	.....	.....	..	..	.....	..	.....	450	15
.....	.....	...	T	S	.....	.....	UF(137)	C	11.5	.....	.....	....	.....	.....	.....	.....	..	..	.....	..	.....	150	.....
.....	.....	...	M	Da	.....	.....	UF(126)	C	14.8	2400	.....	.....	.....	.....	.....	.....	..	..	.....	..	.....	130	0.65
.....	.....	...	M	Da, V	.....	Da	O	O	18.1	...	Du	R	.....	.....	.....	.....	..	..	.....	..	.....	46	.....
.....	.....	...	M, T	S, Da	.....	.....	TG(222)	Ca	11.0	....	2Du	S	.....	.....	.....	.....	..	..	.....	..	.....	70	.....
.....	.....	...	M	Da	M	Da	P	C	13.6	....	1M, 3T	S, R	.....	.....	.....	.....	..	..	.....	..	.....	180	.....
.....	.....	...	2M, T	Da	.....	.....	P	C	14.3	.....	T	S	.....	.....	.....	.....	..	..	.....	..	.....	150	0.5
.....	.....	...	M	V	M, T	Da	TG(240)	Ca	11.5	2500	1M, 2T	R	.....	.....	.....	.....	..	..	.....	..	.....	170	1.75
.....	.....	...	M, T	S	M, T	S	UF	C	.....	.....	2T	R	.....	.....	.....	.....	..	..	.....	..	.....	60	.....
.....	.....	...	T	Da	M	.....	O	O	.....	.....	1M, 1T	R	.....	.....	.....	.....	..	..	.....	..	.....	28	.....
.....	6.9	Tu	T	S	T	S	G	G	1.05	.....	3T	S	12	....	MS	1.0	..	..	.....	2	Ae	400	.....
4.0	.....	...	M	S	M	S	UF(199)	C	14.2	2400	1M, 1T	....	.....	.....	.....	.....	..	..	.....	..	.....	260	.....
.....	.....	...	M	Da	M	Da	SS	C	11.0	....	2Du	R	.....	.....	.....	.....	..	..	.....	..	.....	38	.....
.....	7.0	Tu	M	Da	M, T	Da	P	C	14.4	.....	Du	R	.....	.....	.....	.....	..	..	.....	..	.....	200	7
1.2	0.5	Tu	M	Da	M	Da	P	C	13.5	2600	2T	S	.....	.....	.....	.....	..	..	.....	..	.....	100	.....
.....	.....	...	T	S	T	S	G	G	1.05	.....	T	R	.....	.....	.....	.....	..	..	.....	..	.....	750	.....
.....	.....	...	M	Da	.....	Da	SS(243)	C	13.0	2400	T	R	.....	.....	.....	.....	..	..	.....	..	.....	135	7
.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	..	..	.....	..	.....	.....	.....
.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	..	..	.....	..	.....	.....	.....
.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	..	..	.....	..	.....	.....	.....
.....	.....	Pl	T, 2Mp	V	2M	S	P,	C	.....	....	T	R	7.5	3600	WE	15.0	2	..	.....	..	....	.....	.....
.....	.....	Pl	T, 2Mp	V	M, T	S	P,	C			T	R											
.....	21.5	Tu	M	Da	M	Hy	P	C	10.6-14.0	1950	M	....	.....	.....	.....	.....	..	..	.....	..	.....	.....	.....
.....	4.8	Pl	M	V	M	S	P	C	13.0	1900	T	S	.....	.....	.....	.....	..	..	.....	..	.....	140	.....
.....	7.6	Pl	M	V	M	Hy	P	C	10.5	1900	M, T	S	3.5	3600	BB	165	..	..	.....	..	.....	.....	.....
.....	5.6	Pl	M	V	M	Hy	P	C	13.6	2300	T	S	4.0	3600	WE	0.5	2	A	2.23	2	Ad	190	7.6
4.8	12.5	Tu	M	V	T	S	P	C	11.5	2350	M	R	16	3600	CP	1.0	0	A	15	2	Ad	555	35
.....	6.1	Tu	T	S, V	T	S, Da	TG	C	13.0	2300	T	S, R	.....	.....	.....	.....	..	..	.....	..	.....	180	.....
.....	4.4	Tu	T	S, Da	T	S, V	P, O	C	13.4	2200	M, Du	S, R	.....	.....	.....	.....	..	..	.....	..	.....	110	.....
.....	3.1	Tu	M, T	Da	M, T	Da	O, G	O	18.6	....	Du	R	.....	.....	.....	.....	..	..	.....	..	.....	200	.....
.....	.....	...	M	Da	.....	.....	O, G	O	18.5	....	T	....	.....	.....	.....	.....	..	..	.....	..	.....	150	.....
.....	28.3	Re	2M, 3T	V, S	2M, 3T	Hy, S	P	C	13.1	2300	3M, 2T	S	20	1800	WE	0.75	0	A	13.4	2	Mu	1540	24
													4	3600	WE	55.0	1	A	.....	..	....		
.....	.....	...	.....	.....	.....	.....	CG	C	.....	.....	.....	.....	.....	.....	.....	.....	..	..	.....	..	.....	.....	.....
2.0	.....	...	M	V	M	Da	UF	C	13.5	2500	2M	Du	.....	.....	.....	.....	..	..	.....	..	.....	69	.....
.....	.....	...	T	S, Da	.....	Da	UF	C	14.3	2650	2Du	S, R	.....	.....	.....	.....	..	..	.....	..	.....	51	.....
.....	6.5	Pl	M	S	M	S	P, L	L	7.4	....	T	R	10	1800	AC	0.5	1	A	.....	2	Ad	200	17.5
.....	7.4	Pl	M	V	M	Da	P	C	13.3	....	T	S	.....	.....	.....	.....	..	..	.....	..	.....	.....	.....
.....	.....	...	.....	.....	.....	.....	SS	C	.....	.....	.....	.....	.....	.....	.....	.....	..	..	.....	..	.....	.....	.....
.....	.....	...	M	.....	.....	.....	UF	C	13.2	1900	.....	.....	.....	.....	.....	.....	..	..	.....	..	.....	.....	.....
.....	.....	...	.....	Da	.....	Da	O	C, O	.....	.....	.....	.....	.....	.....	.....	.....	..	..	.....	..	.....	80	3
.....	.....	...	M, T	Da, V	.....	Da	SS	C	14.5	....	1M, 2T	R	.....	.....	.....	.....	..	..	.....	..	.....	120	.....
.....	5.9	Pl	M	V	M	V	P	C	13.1	....	M	....	5	3600	GE	0.5	1	A	6.6	2	Br	137	6.6
0.9	.....	...	M, T	Da	M, T	Da	TG, SS	C	13.5	2520	1M, 1T	R	.....	.....	.....	.....	..	..	.....	..	.....	60	.....
.....	.....	...	M	Da, Hy	.....	.....	UF	C	13.5	2400	1M, 1T, Si	S, Hy	0.09	2000	WE	5.0	..	..	.....	..	.....	30	0.09

Under Construction Since September, 1941

0	19.6	Re	D	V	D	V	O, G	O	13.0	...	1M	...	20	3600	GE	1.0	4	H	16.0	..	....	600	40
0	2.93	Tu	D	S, Da	M	.....	SS[2]	C	12.2	2100	1T, 2D	S, R	2	3600	MS	0.75	1	A	3.0	2	Ad	80	3.75
0	0	...	2Mp	Da	.....	.....	UF(212)	C	12.5	2300	.....	.....	.....	.....	.....	.....	..	..	.....	..	.....	255	8
.....	10.6	Tu	D	V	D	Da	G	G	1.03[5]	.....	2M, 1T	S, R	5.0	3600	EL	1.0	3	A	7.5	2	Ad	190	10
.....	.....	...	M	S, Hy	M	S, V	TG	C	10.5	2050	1D, 1T	R	2.5	3600	EL	1.0	2	A	4.75	2	Mu	64	4
.....	.....	...	M	S, Hy	M	S, V	TG	C	10.5	2050	1M	R											
.....	5.5	Tu	M	S, Da	1M, 1T	S, Da	P, G, O	C	10.5	2050	1M, 1T, 1Du	S, R	4.0	3600	EL	1.0	3	A	7.0	2	....	125	8
0	7.0	...	2Mp	Da	2Mp	2Mp	G	G	1.05	....	2M, 1Du	R	6.0	3600	EL	1.0	3	A	8.0	1	....	140	11
.....	.....	...	.....	.....	.....	.....	P	.....	.....	.....	.....	.....	10.0	....	AC	.....	..	..	20.0	..	.....	.....	.....
2.96	0	...	M	V	T	S	SS(125)	C	11.25	....	2T	....	.....	.....	.....	.....	..	..	.....	..	.....	100	.....
1.90	0	...	.....	.....	T	Da	G	G	1.00[5]	....	1M, 1T	R	5.0	3600	GE	0.75	3	A	6.0	2	Ad	160	8
.....	9.20	Tu	M	Ma	M	Ma	G	G	.....	.....	2M, 1T	R	6.0	3600	WE	0.75	3	A	7.5	2	....	140	13.6
.....	0	...	2Mp	V	2Mp	V	SS(242)	C	11.1	2000	1M, 1T	R	6.0	3600	EL	1.0	3	A	....	2	Ad	150	12.75
....	3.97	Tu	M	V, Da	M	V, Da	O	O	18.5	....	1M, 1T	R	5.0	3600	WE	1.2	3	A	8.0	2	Ad	213	9.0
0	0	...	T	Da	T	Da	P	C	12.5	2100	2T	....	3.0	3600	AC	1.0	0	A	4.2	2	Ad	120	8
0	0	...	M	Da	.....	.....	SS(115)	C	11.0	2100	.....	.....	.....	.....	.....	.....	..	..	.....	..	.....	66	.....
0	.....	Tu	M	Da	2Mp	Da	P	C	13.0	2400	1M, 1T	R	5.0	3600	WE	.....	3	A	5.5	2	Ad	125	10.5
0	16.03	Tu	Du	V	Du	Hy	P, O	C	12.2	2100	.....	.....	15.0	3600	CP	0.6	2	A	16.0	2	Mu	425	43
0	16.96	Tu	Du[3]	Ma	Du[3]	Ma	TG(540)	C[4]	8.6	2120	1M, 1T	R	3.0	1800	GE	0.75	0	A	9.0	3	Ad	137	9.0
0	.....	Pl	M	Da	M	Da	G	G	0.98[5]	.....	2T	R	2.5	....	AC	0.50	..	A	6.23	2	....	70	3.86
0.79	.....	...	M	.....	Du	Da	.....	C	11.38	1900	2T, 2Du	R											

Typical Industrials 200 psi and Under

Compiled by J C McCabe
Assistant Editor

Company	Location	First Operation Now Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS Number	BOILERS Capacity, Each 1000 lb per hr	BOILERS Manufacturer	Firing	TURBINES Capacity, 1000 kw	TURBINES Speed, rpm	TURBINES Manufacturer	TURBINES Backpressure, psi	TURBINES No. of Bleed Points	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
200 PSI															
Atlas Powder Co.	Stamford, Conn.	8-46	200	490	1	60	CE	TG (240)	....	....	....	....	..	60	.....
Behr-Manning Corp.	Watervliet, N. Y.	1-44	200	366	1	40	RS	P	....	....	....	....	..	80	.....
Dewey Portland Cement Co.	Davenport, Iowa	.....	200	480	4	30	EM	C	4.5	1800	GE	....	..	140	5.15
Exchange Orange Prod Co.	Ontario, Calif.	.....	200	388	1	33	BW	O	....	....	....	....	..	33	.....
Fleming & Sons, Co.	Dallas, Tex.	9-46	200	427	1	50	Vo	G	1.75	3600	WE	....	1	231	4.0
General Electric Co.	Tiffin, Ohio	6-46	200	Sat	2	20	BW	SS (63)	....	....	....	....	..	40	.....
Hinde & Dauch Co.	Cleveland, Ohio	7-46	200	...	1	18	BW	O	....	....	....	....	..	18	.....
Hinde & Dauch Co.	Buffalo, N. Y.	.....	200	...	1	18	BW	O	....	....	....	....	..	18	.....
Hinde & Dauch Co.	Watertown, Mass.	.....	200	...	1	18	BW	O	....	....	....	....	..	18	.....
Neosho Valley Cooperative	Erie, Kan.	3-46	200	...	1	25	BW	CA, O	....	....	....	....	..	25	.....
N. Y. & Richmond Gas Co.	Staten Island, N. Y.	11-45	200	450	1	13	BW	UF (85)	....	....	....	....	..	....	.....
Northwest Paper Co.	Brainerd, Minn.	10-45	200	Sat	1	60	CE	SS (129)	....	....	....	....	..	110	.....
Pasco Packing Assn.	Dade City, Fla.	3-45	200	Sat	1	00	BW	O	....	....	....	....	..	180	2.5
Plainfield Union Water Co.	Plainfield, N. J.	5-46	200	388	1	19	BW	UF (63)	....	....	....	....	..	34	.....
Todd Shipyards, Inc.	San Pedro, Calif.	2-46	200	Sat	4	5.5	OW	O	....	....	....	....	..	16	.....
160 TO 199 PSI															
Lake City Ordnance Plant	Independence, Mo.	10-41	190	Sat	3	75	BW	O, G	....	....	....	....	..	225	.....
General Electric Co.	Danville, Ill.	6-46	185	Sat	2	15	BW	G	....	....	....	....	..	30	.....
J D Grover & Sons, Co.	Philadelphia, Pa.	8-46	185	382	1	25	EM	O	....	....	....	....	..	50	.....
Curtiss-Wright Corp.	Columbus, Ohio	9-41	175	378	3	75	RS	C, O	....	....	....	....	..	250	.....
		9-41	175	378	1	25	RS	C, O							
Eastman Kodak Co.	Rochester, N. Y.	1941	175	377	2	20	K	UF (90)	....	....	....	....	..	100	.....
		1941	175	490	2	30	BW	UF (90)							
Frontier Refining Co.	Cheyenne, Wyo.	.....	175	...	2	15	BW	O	....	....	....	....	..	30	.....
General Electric Co.	Fort Edward, N. Y.	1946	175	...	2	12	BW	O	....	....	....	....	..	24	.....
General Foods Corp.	Orange, Mass.	11-45	175	377	1	20	RS	UF (59)	....	....	....	....	..	25.5	.....
Norfolk Shipbuilding Corp.	Norfolk, Va.	3-42	175	...	2	15.5	CE	SS (38)	....	....	....	....	..	31	.....
Abbott Laboratories	North Chicago, Ill.	1944	160	370	1	40	EM	C	....	....	....	....	..	101	.....
Allis-Chalmers Mfg Co.	Springfield, Ill.	4-45	160	420	2	60	RS	C	....	....	....	....	..	120	.....
Allis-Chalmers Mfg Co.	West Allis, Wis.	.....	160	470	3	150	RS	P	7.4	3600	AC	0.75	0	672	19.4
Bethlehem Steel Corp.	Bethlehem, Pa.	.....	160	500	4	125	RS	O, G	....	....	....	....	..	1936	33
		.....	160	500	2	80	BW	O							
		.....	160	500	3	13.6	CE	WG							
Continental Distilling Corp.	Philadelphia, Pa.	1944	160	Sat	2	75	CE	UF (236)	....	....	....	....	..	300	.....
Intl Bus Machines Corp.	Endicott, N. Y.	11-44	160	360	1	80	BW	UF (204)	1.3	1320	MS	2.0	1	160	1.3
Northern Pacific Rwy Co.	Livingston, Mont.	8-45	160	364	2	53	BW	SS (184)	....	....	....	....	..	....	.....
Ohio Match Co.	Wadsworth, Ohio	.....	160	385	1	65	RS	TG (215)	....	....	....	....	..	130	1.5
Peoples Natural Gas	Brave, Pa.	7-46	160	420	3	80	BW	P	2	3600	EI	1.25	0	240	2.0
Publicker Industries, Inc.	Philadelphia, Pa.	1944	160	Sat	2	100	RS	P, O	....	....	....	....	..	1260	.....
Scovill Mfg Co.	Oakville, Conn.	5-46	160	500	1	25	BW	TG (98)	0.5	3600	WE	1.0	1	100	1.5
Seattle Gas Co.	Seattle, Wash.	.....	160	Sat.	2	50	BW	O	....	....	....	....	..	....	.....
Skelly Oil Co.	Eldorado, Kan.	.....	160	500	3	65	VO	O	0.1	3600	GE	15.0	0	295	0.1
		.....	160	500	4	25	HB	O							
Southern Calif. Gas Co.	Los Angeles, Calif.	6-43	160	Sat	3	70	BW	O	....	....	....	....	..	....	.....
Spokane A T S Command	Galena, Wash.	10-43	160	370	3	110	RS	P	....	....	....	....	..	330	.....
Spokane, Portland & Seattle Rwy.	Portland, Ore.	5-46	160	370	2	7.5	BW	O	....	....	....	....	..	15	15
150 PSI AND BELOW															
Allis-Chalmers Mfg. Co.	Norwood, Ohio	12-41	150	365	1	40	BW	P	....	....	....	....	..	....	.....
Baldwin Locomotive Wks.	Burnham, Pa.	10-43	150	500	2	90	BW	P	....	....	....	....	..	360	.....
Carstens Packing Co.	Spokane, Wash.	.....	150	324	2	6	CE	SS	....	....	....	....	..	....	.....
Citrus Concentrates, Inc.	Dunedin, Fla.	1-43	150	Sat	3	33	BW	O	1.25	3600	WE	5	1	159	1.25
E I du Pont de Nemours	Arlington, N. J.	.....	150	366	1	50	BW	P	....	....	....	....	..	....	.....
Ellsworth Co-op Creamery	Ellsworth, Wis.	3-45	150	...	1	25	RS	UF (75)	....	....	....	....	..	41	.....
General Foods Corp.	Hillsboro, Ore.	5-46	150	366	1	15	RS	O	....	....	....	....	..	25	.....
General Motors Corp.	Wilmington, Del.	7-46	150	366	3	60	BW	O	....	....	....	....	..	180	180
G M C-Frigidaire	Moraine City, Ohio	10-40	150	Sat	1	00	BW	P	....	....	....	....	..	428	.....
Hooker Electrochemical Co.	Niagara Falls, N. Y.	1-44	150	366	1	50	EC	P	....	....	....	....	..	200	.....
Knowlton Bros.	Watertown, N. Y.	1-46	150	366	1	25	BW	UF (82)	....	....	....	....	..	....	.....
Miami Valley Coated Paper	Franklin, Ohio	2-46	150	...	1	16.4	BW	TG	....	....	....	....	..	....	.....
Naval Torpedo Station	Keyport, Wash.	.....	150	Sat	2	12	LI	O	0.5	3600	WE	1.0	0	49	13
		.....	150	Sat	1	25	BW	O							
Plywood Plastics Corp.	Hampton, S. C.	.....	150	...	2	18	....	O, W	....	....	....	....	..	90	.....
R J Reynolds Tobacco Co.	Danville, Va.	1-46	150	Sat	1	26.5	CE	SS (73)	....	....	....	....	..	26.5	.....
Rubsam & Horrmann Brewing	Staten Island, N. Y.	1-43	150	Sat	1	20	EC	P	....	....	....	....	..	40	.....
Tantalum Defense Corp.	North Chicago, Ill.	6-42	150	366	3	40	BW	SS (150)	....	....	....	....	..	120	.....
University of Missouri	Rolla, Mo.	1946	150	366	2	18	BW	CG (75)	....	....	....	....	..	36	.....
University of Akron	Akron, Ohio	9-46	150	Sat	2	15	BW	UF (54)	....	....	....	....	..	30	.....
Upjohn Co.	Kalamazoo, Mich.	1-45	150	...	1	45	UI	UF	....	....	....	....	..	....	.....
Ganado Mission	Ganado, Ariz.	12-42	140	Sat	1	7	LI	SS (40)	....	....	....	....	..	22	0.25
		3-46	140	Sat	1	15	BW	SS (54)							
Mohawk Carpet Mills	Amsterdam, N. Y.	.....	140	360	2	60	CE	P	....	....	....	....	..	120	.....
Naval Air Station	Lakehurst, N. J.	.....	135	350	3	35	BW	O	....	....	....	....	..	120	.....
Alden Mills	New Orleans, La.	10-45	130	356	1	7	BW	G	....	....	....	....	..	....	.....
Virginia Hot Springs	Hot Springs, Va.	.....	130	355	1	24.7	BW	UF (72)	....	....	....	....	..	55	1.0
Deep Sea Products Co.	Aberdeen, Wash.	2-46	125	Sat	1	10	RS	O	....	....	....	....	..	10	.....
Diebold, Inc.	Canton, Ohio	1942	125	...	2	23	BW	C	....	....	....	....	..	....	.....
Eagle Picher Co.	Joplin, Mo.	1-43	125	462	1	23	RS	O	....	....	....	....	..	43	.....
Excelsior Mill	Union, S. C.	.....	125	353	1	32.5	BW	SS (90)	....	....	....	....	..	48.3	.....
H J Heinz Co.	Medina, N. Y.	9-45	125	Sat	1	60	BW	P	....	....	....	....	..	....	.....
	Tracy, Calif.	6-46	125	...	3	50	BW	O, G	....	....	....	....	..	150	.....
Lloyd Mfg Co.	Menominee, Mich.	11-46	125	338	2	30	CE	SS (125)	....	....	....	....	..	60	.....
J A Manning Paper Co.	Troy, N. Y.	9-46	125	Sat	2	12	RS	UF (50)	....	....	....	....	..	....	.....
Naval Air Station	Jacksonville, Fla.	12-42	125	344	3	13.5	BW	O	....	....	....	....	..	40	0.375
Page Milk Co.	Merrill, Wis.	1944	125	...	1	25	UI	P	....	....	....	....	..	....	0.225
Physical Culture Hotel	Dansville, N. Y.	.....	125	...	1	10	BI	....	....	....	....	....	..	20	.....
		.....	125	...	1	10	CE	UF							
Washington Gas Light Co.	Washington, D. C.	2-43	125	344	1	70	BW	P	....	....	....	....	..	366	.....
		12-41	125	344	2	50	BW	P							
Western Condensing Co.	Mishicot, Wis.	3-44	125	345	1	10	UI	P	....	....	....	....	..	....	.....
Wyman Gordon Co.	Harvey, Ill.	1943	120	350	3	80	BW	SS (192)	....	....	....	....	..	240	.....
McGuire General Hosp.	Richmond, Va.	3-44	110	344	4	30	UI	SS	....	....	....	....	..	120	.....
Naval Air Station	Olathe, Kan.	9-42	110	Sat	3	40	BW	O, G	....	....	....	....	..	120	0.3
American Asphalt Roof	Kansas City, Mo.	3-46	100	330	1	13	CE	CA	....	....	....	....	..	9	13
Boeing Aircraft Co.	Seattle, Wash.	1942	100	338	2	14	KB	O	....	....	....	....	..	112	.....
		1946	100	650	1	14	RS	O							

Built or on Order Since September, 1941

Compiled by J C McCabe
Assistant Editor

Company	Location	First Operation New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	BOILERS: Capacity, Each 1000 lb per hr	BOILERS: Manufacturer	Firing	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Backpressure, psi	TURBINES: No. of Bleed Points	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
150 PSI AND BELOW — *Continued*															
R C A Corp	Lancaster, Pa	.....	100	345	3	7	KB	UF (56)	....	....	....	....	..	36	.....
		.....	100	345	1	15	CE	TG (58)							
U. S. Army	Camp Butner, N. C.	9-42	100	340	5	7	BW	UF (36)	....	....	....	....	..	15.7	.....
Warumbo Mfg. Co.	Lisbon Falls, Me	9-46	100	...	4	88	BW	SS (56)	....	....	....	....	..	...	.....
Westinghouse Elec. Corp	Attica, N. Y.	5-45	100	308	1	27	BW	UF (51)	....	....	....	....	..	45	.....
Winthrop Mills	Winthrop, Me	6-43	100	...	1	18	BW	UF	....	....	....	....	..	30	0.225
		6-43	100	...	2	12	IB	UF							
CANADA															
Canadian Intl Paper Co	Gatineau, Que	12-46	200	455	1	200	CE	P	....	....	....	....	..	700	.....
Canadian Vickers, Ltd	Maigonneure, Que	6-41	200	388	3	18	VK	UF (54)	....	....	....	....	..	55	.....
Consumers Gas Co	Toronto, Ont	1946	200	453	1	45	DB	O, G	....	....	....	....	..	....	.....
Kroehler Mfg. Co., Ltd	Stratford, Ont	7-46	200	...	1	18	BWG	UF (54)	....	....	....	....	..	....	0.4
Rolland Paper Co	St Jerome, Que	10-45	200	...	1	18	VK	SS	.02	3600	BW	10	0	60	.....
		3-46	200	...	1	18	VK	SS							
160 TO 199 PSI															
British-American Oil Co., Ltd	Clarkson, Ont	10-43	185	480	3	60	FW	O, G	....	....	....	....	..	180	.....
Canadian Pacific Rwy	Montreal, Que	11-41	185	525	2	100	CE	P	....	....	....	....	..	....	.....
Dominion Silk Dyeing Co., Ltd	Drummondville	12-42	185	382	1	45	BW	P	....	....	....	....	..	105	.....
Toronto Terminals Rwy	Toronto, Ont	1-44	180	550	1	100	BWG	P	....	....	....	....	..	297	.....
Truro Electric Comm	Truro, N. S.	1942	180	540	1	30	BWG	P	....	....	....	....	..	60	.....
Brompton Pulp & Paper Co	Red Rock, Ont	10-45	175	477	2	60	CE	P	....	....	....	....	..	208	.....
Building Products, Ltd	Ville La Salle, Que	9-45	175	Sat	2	22	CV	O	....	....	....	....	..	44	.....
Canada Wire & Cable Co	Toronto, Ont	1944	175	...	1	30	FW	UF (87)	....	....	....	....	..	75	.....
E B Eddy	Hull, Que	1945	175	508	1	100	BWG	UF (286)	....	....	....	....	..	280	.....
Shawinigan Chem Co	Shawinigan Falls, Que	11-41	175	377	1	60	FW	P	....	....	....	....	..	60	.....
J R Booth, Ltd	Ottawa, Ont	1944	165	480	2	70	FW	P	....	....	....	....	..	225	.....
Booth Lumber, Ltd	Tee Lake, Que	5-46	160	415	1	35	FW	W	0.4	4500	MS	19	0	63	.525
Eldorado, 2nd	Port Hope, Ont	1943	160	Sat	1	25	DB	C	....	....	....	....	..	....	.....
Canadian Pacific Rwy	Winnipeg, Man	2-44	160	500	3	40	FW	TG (156)	....	....	....	....	..	120	.....
Dominion Engrg Wks	Rockfield, Que	10-42	160	...	3	25	DB	UF (76)	....	....	....	....	..	....	.....
Hamilton By-Product Coke	Hamilton, Ont	6-42	160	565	1	15	BW	TG (83)	....	....	....	....	..	....	.....
Victoria Hospital	Halifax, N. S.	1946	160	Sat	2	18	DB	C	....	....	....	....	..	....	.....
150 PSI AND BELOW															
Alberta Provincial Govt	Oliver, Alta	12-41	150	366	1	20	BWG	TG (77)	....	....	....	....	..	45	0.55
Alberta, University of	Edmonton, Alta	2-45	150	Sat	2	18	FW	G	....	....	....	....	..	98	.....
J A Y Bouchard, Inc	Quebec City, Que	9-45	150	Sat	2	9	CB	O	....	....	....	....	..	27	.....
Canadian Copper Refiners	Montreal East, Que	.....	150	420	1	40	VK	O	....	....	....	....	..	150	.....
Canadian Vickers Ltd	Cartierville, Que	8-44	150	366	1	10	CV	UF (42)	....	....	....	....	..	30	.....
Donnacona Paper Co	Donnacona, Que	5-46	150	366	1	65	DB	Elec	....	....	....	....	..	360	.....
International Harvester Co	Hamilton, Ont	4-46	150	441	3	40	FW	SS (110)	....	....	....	....	..	120	1.0
J Lewis & Sons, Ltd	Truro, N. S.	.....	150	500	1	33	BWG	TG (124)	....	....	....	....	..	51	.....
National Steel Car Corp	Hamilton, Ont	1941	150	366	2	25	BW	UF (87)	....	....	....	....	..	71	.....
N M C Dockyard	Halifax, N. S.	9-43	150	358	3	30	VK	UF (110)	....	....	....	....	..	90	.....
Nova Scotia Lt & Pwr Co	Halifax, N. S.	1942	150	500	1	35	BWG	TG (123)	....	....	....	....	..	....	5
Proctor & Gamble Co	Hamilton, Ont	.....	150	Sat	2	40	BWG	TG (135)	....	....	....	....	..	....	.....
Swift Canadian Co	Edmonton, Alta	7-42	150	360	..	45	BWG	G	....	....	....	....	..	80	.....
Canadian Durex Abrasives	Brantford, Ont	10-42	148	Sat	2	11	BWG	UF (40)	....	....	....	....	..	22	.....
Gypsum Lime & Alabastine Co	Caledonia, Ont	....	145	360	2	30	CE	UF (66)	....	....	....	....	..	50	.....
National Defense Dept	Halifax, N. S.	10-42	145	363	2	35	BW		....	....	....	....	..	85	.....
		10-42	145	363	1	15	BW								
Canadian General Elec. Co	Toronto, Ont	1941	140	Sat	2	25	BWG	TG (98)	....	....	....	....	..	45	.....
Canadian Industries, Ltd	Brownsburg, Que	1943	140	450	1	25	VK	UF (77)	....	....	....	....	..	....	.....
Canadian Westinghouse, Ltd	Hamilton, Ont	12-41	135	358	2	60	FW	UF (108)	....	....	....	....	..	120	.....
Consumers Gas Co	Toronto, Ont	1945	130	430	3	25	DB	TG (126)	....	....	....	....	..	75	.....
Sunnybrook Hospital	Toronto, Ont	11-45	130	350	3	30	FW	UF (92)	0.128	3750	BW	6	..	90	0.128
Canadian Raybestos, Ltd	Peterborough, Ont	1-46	125	350	1	10	FW	O	....	....	....	....	..	18	.....
Dominion Forge & Stamping Co	Walkerville, Ont	7-43	125	...	2	14	FW	SS (53)	....	....	....	....	..	60	.....
Dryden Paper Co, Ltd	Dryden, Ont	7-45	125	353	1	50	CE	BL	....	....	....	....	..	170	.....
		2-43	125	353	1	30	LS	SS (96)							
W & A Gilbey, Ltd	New Toronto, Ont	12-43	125	350	1	6.2	BW	O	....	....	....	....	..	12.4	.....
Imperial Leaf Tobacco Co	Aylmer, Ont	11-46	125	...	2	5	FW	O	....	....	....	....	..	9.0	.....
Royal Alexandra Hospital	Edmonton, Alta	11-46	125	353	3	10	FW	G	0.25	3600	K	20	0	30	0.25
Toronto, University of	Ajax, Ont	1-46	125	460	5	25	CV	UF (77)	....	....	....	....	..	125	.....
Electric Reduction Co	Buckingham, Que	1941	120	Sat	1	20	FW	UF (65)	....	....	....	....	..	75	.....
		1945	120	Sat	1	40	FW	UF (149)							
H J Heinz Co of Canada	Wallaceburg, Ont	8-44	120	Sat	3	46	BWG	TG (130)	....	....	....	....	..	138	.....
Federal Wire & Cable Co	Guelph, Ont	5-46	110	Sat	1	10	FW	UF	....	....	....	....	..	12	.....
Fry-Cadbury, Ltd	Montreal, Que	.....	100	...	1	12	FW	O	....	....	....	....	..	18	.....
Laurentian Sanitorium	Ste. Agathe des Monts, Que	1942	100	Sat	1	14	DB	C	....	....	....	....	..	....	.....

TABLE OF SYMBOLS AND ABBREVIATIONS

AC —Allis-Chalmers Mfg Co
BI —Bigelow Boiler Co
BL —Black liquor
BW —Babcock & Wilcox Co
BWG—Babcock-Wilcox & Goldie-McCullough, Ltd
C —Coal, bituminous
CA —Coal, anthracite
CB —Coke Breeze
CE —Combustion Engineering Co
CG —Chain grate
CV —Canadian Vickers Co, Ltd
DB —Dominion Bridge Co, Ltd
EC —Erie City Iron Works
El —Elliott Co
Elec —Electric Boiler
EM —Edge Moor Iron Works
FW —Foster Wheeler Corp
G —Gas
GE —General Electric Co
HB —Heine Boiler Co
IB —International Boiler Co
K —Kerr Turbine Co
KB —Kewanee Boiler Co
KE —Keeler Boiler Co
L —Lignite
LI —Llewellyn Iron Wks
LS —E Leonard & Sons, Ltd
MS —Moore Steam Turbine Div
O —Oil
OW —Oil Well Supply Co
P —Pulverized-fuel firing
RS —Riley Stoker Corp
SS —Spreader stoker
TG —Traveling grate
UF —Underfeed stoker
UI —Union Iron Works
VK —Vickers Keeler
Vo —Henry Vogt Machine Co
W —Wood waste
(150)—Stoker grate area, sq ft

Record-Breaking Diesel Output Went to Armed Forces; Postwar Engines Improved

► DURING THE WAR YEARS the diesel-engine industry built a total engine horsepower greater than its entire production up to the beginning of the war. Virtually all of this tremendously expanded output went to the armed forces. The tables below reflect this situation and also the fact that some builders were unable to supply data on the relatively few stationary installations made during this period. Thus it comes about that an unusually small list of typical stationary installations marks the industry's biggest years.

As a result of this concentration on military requirements, a considerable backlog of civilian demand exists in all fields of diesel application. Many of the more than 750 municipal diesel plants require new capacity to meet expecte increased demand and to restore safe margins of reserve. A similar situation holds in many industrial plants, and modernization programs will further increase demand for both diesel and gas engines.

Accelerated research and development of the war years means that postwar internal-combustion engines will embody many significant improvements, without, however, departing radically from designs proved by experience. Range of engine size will be greater, with one manufacturer offering single-acting 29x40-in units rated up to 8000 hp for marine use and 6000 kw for stationary use. More than usual activity is evident in the field of extremely small engines also—15 hp and below. The trend to higher rotative and piston speeds may be expected to continue, rpm ranging from 200 to 3000

Typical Diesel and Gas Engine Plants

Owner	Location	Equipt driven	Engine builder	Type	No. of units	Horsepower each	Speed rpm	No. cyl	Bore, in.	Stroke, in.	Cycle	Fuel injection	Fuel rate, lb/bhp-hr, or 1000 Btu/bhp-hr	Other capacity, same plant
Logan City Corp*	Logan, Utah	CS Gen	BuS	D	1	3400†	240	10	20½	27½	2	S	.37	6560-D
Southeastern Indiana Pwr Co*	Rushville, Ind	CS Gen	BuS	D	1	3060	240	9	20½	27½	2	S	.37	9180-D
City of Hutchinson	Hutchinson, Minn	CS Gen	BuS	D	1	3060	240	9	20½	27½	2	S	.37	6435-D
City of Hudson	Hudson, Mass	CS Gen	BuS	D	1	3000	240	9	20½	27½	2	S	.37	5155-D
City of Lake Worth	Lake Worth, Fla	CS Gen	BuS	D	2	2040	240	6	20½	27½	2	S	.37	4125-D
City of Pierre	Pierre, S. Dakota	CS Gen	FIW	D	1	2000	225	8	23	28	4	S	.37	2500-D
Wisconsin Hydro El Co	Clear Lake, Wis	CS Gen	BuS	D	1	1700	240	5	20½	27½	2	S	.38	1700-D
Eastern Shore Pub Serv Co*	Cape Charles, Va	CS Gen	BuS	D	1	1600	277	8	16½	24½	4	S	.38	.....
City of Abbeville*	Abbeville, S. C	CS Gen	BuS	Dt	1	1600	277	8	16½	24½	4	S	.385	.....
City of Wahoo*	Wahoo, Neb	CS Gen	BuS	Dt	1	1600	277	8	16½	24½	4	S	.37	2300-D
Ozark Ordnance Works	Eldorado, Ark	Gen	RJ	G	11	1000††	300	8	18½	24	4	..	....	.....
Illinois Rural El Co*	Winchester, Ill	CS Gen	BuS	D	1	1500	257	8	16½	24½	4	S	.38	1875-D
City of Jackson	Jackson, Mo	CS Gen	BuS	Dt	1	1500	257	8	16½	24½	4	S	.38	2015-D
City of Bryan	Bryan, Texas	CS Gen	BuS	D	1	1500	257	8	16½	24½	4	S	.38	5000-D
City of Ruston	Ruston, La	CS Gen	BuS	D	1	1500	257	8	16½	24½	4	S	.38	2650-D
City of Algona	Algona, Iowa	CS Gen	FIW	D	1	1500	225	6	23	28	4	S	.37	4250-D
City of Oxford*	Oxford, Miss	CS Gen	BuS	Dt	1	1500	257	8	16½	24½	4	S	.37	2025-D
City of Harlan	Harlan, Iowa	CS Gen	FIW	D	1	1500	225	6	23	28	4	S	.37	4125-D
City of Ord*	Ord, Neb	CS Gen	BuS	Dt	1	1470	257	8	16½	24½	4	S	.37	1430-D
Central El Fed Coop Assn	Dickens, Iowa	CS Gen	Sup	D	1	1450	360	8	14½	20	4	S	....	.....
Rock Island Arsenal	Rock Island, Ill	Gen	BuS	D	1	1360	240	4	20½	27½	2	S	.38	.....
Stanolind Pipe Line Co	La Plata, Mo	Pump	FIW	Dt	1	1350	277	6	17½	24½	4	S	.37	.....
City of Vermillion	Vermillion, S. Dakota	CS Gen	FIW	DF	1	1300	277	8	17½	24½	4	S	.37	1800-D
City of Conway	Conway, Ark	CS Gen	FIW	D	1	1280	277	8	17½	24½	4	S	.37	2675-D
Paragould Municipal Plant	Paragould, Ark	CS Gen	Sup	D	2	1200	327	8	14½	20	4	S	....	.....
Defense Plant Corp	Jones Mills, Ark	Gen	CB	CG	50	1165	350	10	14	14	2	..	....	64,800-GD
City of Russell*	Russell, Kan	CS Gen	BuS	Dt	1	1125	257	6	16½	24½	4	S	.39	3150-D
City of Blair*	Blair, Neb	CS Gen	BuS	Dt	1	1120	257	6	16½	24½	4	S	.37	1500-D
Ebasco International Corp	Mazatlan, Mexico	CS Gen	FIW	D	2	1110	277	7	17½	24½	4	S	.37	1610-D
Fed Coop Power Assn	Hampton, Iowa	CS Gen	Sup	D	2	1083	360	6	14½	20	4	S	....	.....
City of Easton	Easton, Md	CS Gen	FIW	D	1	1000	257	7	17½	24½	4	S	.37	2150-D
Limestone Products Corp	Newton, N. J	Gen	FIW	D	1	1000	257	7	17½	24½	4	S	.37	1120-D
Columbia Quarry	Krause, Ill	Gen	Sup	D	1	1000	300	8	14½	20	4	S	....	.....
					1	825	300	6	14½	20	4	S	....	.....
City of Opelousas*	Opelousas, La	CS Gen	BuS	D	2	1000	257	8	16½	24½	4	S	.38	3500-D
City of Sandersville	Sandersville, Ga	CS Gen	Sup	D	1	960	360	8	14½	20	4	S	....	.....
City of Hawarden	Hawarden, Iowa	CS Gen	FIW	D	1	960	277	6	17½	24½	4	S	.37	1450-D
Birchfield Boiler Works	Tacoma, Wash	Gen	Sup	D	1	850	450	8	12	15	4	S	....	.....
					2	185	514	6	8½	10½	4	S	....	.....
City of Forest City*	Forest City, Iowa	CS Gen	BuS	D	1	820	277	6	16½	24½	4	S	.378	900-D
Village of Bethel	Bethel, Ohio	CS Gen	Sup	D	1	800	300	8	14½	20	4	S	....	.....
Village of Arcanum	Arcanum, Ohio	CS Gen	Sup	D	1	800	300	8	14½	20	4	S	....	.....
Bowery Bay Sewage Wks	New York, N. Y	Gen	RJ	G	2	800	300	7	15½	22	4	..	9.6	None
Ebasco International Corp	Buenaventura, Col., S.A.	CS Gen	FIW	D	2	790	277	5	17½	24½	4	S	.37	2040-D
Ebasco International Corp	Santa Marta, Col., S. A.	CS Gen	FIW	D	1	790	277	5	17½	24½	4	S	.37	1150-D
City of West Point	West Point, Neb	CS Gen	BuS	D	1	750	257	6	16½	24½	4	S	.38	1300-D
City of Sallisaw	Sallisaw, Okla	CS Gen	FIW	D	1	740	257	5	17½	24½	4	S	.37	500-D
City of Greenfield	Greenfield, Iowa	CS Gen	FIW	D	1	740	257	5	17½	24½	4	S	.37	1330-D
City of Osage	Osage, Iowa	CS Gen	FIW	D	3	730	257	5	17½	24½	4	S	.37	None
Atlantic Dredge & Const Co	Okeechobee, Fla	Pump	Sup	D	1	680	500	8	12	15	4	S	....	.....
City of Wisner*	Wisner, Neb	CS Gen	BuS	Dt	1	670	300	6	13	17	4	S	.55	810-D
City of Akron	Akron, Iowa	CS Gen	Sup	D	1	655	327	6	14½	20	4	S	....	.....
City of Electra	Electra, Texas	CS Gen	Sup	D	1	655	400	8	12½	16½	4	S	....	.....
Raymond Concrete Co	New York, N. Y	Gen	Sup	D	3	616	450	8	12	15	4	S	....	.....
Portland Pipe Line Co	Portland, Me	Pump	BuS	D	2	600	225	6	16¼	23	4	A	.40	.....
City of Houston	Houston, Texas	Gen	SE	G	4	600	1200	8	8	9	4	..	10	.....
California Pacific Ut Co	Needles, Calif	Gen	SE	G	2	600	1200	8	8	9	4	..	10	.....
O & A Electric Corp	Burnips, Mich	Gen	Sup	D	1	590	400	6	12	15	4	S	....	.....
Chesapeake & Potomac Tel	Washington, D. C	Gen	Sup	D	3	560	400	8	12½	15	4	S	....	.....

and piston speed from 1100 to 1500 fpm.

The need for higher specific outputs in many fields will undoubtedly be reflected in engines designed for stationary use. Much experience was gained with supercharging in the war years and a number of new developments in this field are maturing now. The result may well be to establish clear-cut economic advantages for supercharging, even in fields where savings in size and weight are unimportant and engine cost and performance are the dominant factors. With intercooling and other improvements, supercharging pressures may be carried to considerably higher levels.

Indications are that opposed-piston designs will become commoner. Experience both here and abroad shows advantages for this arrangement. Two-cycle units of this design lend themselves well to supercharging, particularly the "high" supercharging in which the compressor and exhaust turbine connect to the engine shaft to balance compressor power needs and turbine output (see pp 68-70).

Expanded production facilities in the small-engine field may lead, in the opinion of some observers, to greater application of so-called "packaged" power units. They also see the possibility of using multiple units of this kind in large plants. It is not yet clear whether the savings resulting from expected lower first cost will offset the costs and complication involved in a plant of many small-bore cylinders. Installations of this type might lead to revived interest in "automatic" plants, if practical control problems can be overcome.

The gas-diesel or dual-fuel engine seems to have a bright future in many applications where ability to switch from oil to gas fuel instantly or to operate on a combination of both is advantageous. Such engines now employ low-pressure induction of the gas-air mixture, which may be compressed to diesel pressures for the high efficiency characterizing the diesel cycle. For a comprehensive discussion of both high- and low-pressure gas-diesels, see POWER, May, 1945, pp 64-70, and also Jan 1946, pp 71-75.

Postwar engines will feature many improvements in materials and mechanical construction. New welding processes may find more use in fabrication of frames and structural elements, and cast crankshafts may become more common. New alloys are available for bearings, cylinder liners and other parts. Much experience has been gained with chromium plating of piston rings and cylinder liners.

Installed or on Order Since April 1941

Owner	Location	Equipt driven	Engine builder	Type	No. of units	Horsepower each	Speed rpm	No. cyl	Bore, in.	Stroke, in.	Cycle	Fuel injection	Fuel rate, lb/bhp-hr, or (1000 Btu/bhp-hr	Other capacity, same plant
City of Baldwin	Baldwin, Kan.	CS Gen.	BuS.	D	1	540	360	6	13	20	4	S	.39	595-D
Utah Power & Light Co.	Salt Lake City, Utah	CS Gen.	Sup.	D	2	530	514	6	12	15	4	S	....	.....
Wolverine Diesel Pwr Co.	Detroit, Mich.	Gen.	Sup.	D	1	514	514	6	12	15	4	S	....	.....
					3	320	720	8	8½	10½	4	S	....	.....
Sac County Electric Co.	Sac City, Iowa	Gen.	Sup.	D	1	505	600	8	9	12	4	S	....	.....
Ingenio Sanalona	Sanalona, Mexico	Gen.	FIW	D	1	450	300	6	14	18	4	S	.37	None
Transit & Storage Co.	Michigan	Pump	RJ	D	4	430	300	5	13¼	22	4	S	....	.....
Village of Constantine	Constantine, Mich.	CS Gen.	RJ	D	1	430	300	5	13¼	22	4	S	....	.....
Phillips Petroleum Co.	Jefferson City, Mo.	Pump	SE	G	2	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Syracuse, Mo.	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Richmond, Kan.	Pump	SE	G	2	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Harrisonville, Mo.	Pump	SE	G	2	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Madison, Kan.	Pump	SE	G	2	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Wichita, Kan.	Pump	SE	G	2	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Eldorado, Kan.	Pump	SE	G	2	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Paola, Kan.	Pump	SE	G	2	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Leeton, Miss.	Pump	SE	G	2	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Cheney, Kan.	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Attica, Kan.	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Medicine Lodge, Kan.	Pump	SE	G	2	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Hardtner, Kan.	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Buffalo, Okla.	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Leverne, Okla.	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Gaylord, Texas	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Spearman, Texas	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Rosebud, Mo.	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Villa Ridge, Mo.	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Stinett, Texas	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Phillips Petroleum Co.	Cassoday, Kan.	Pump	SE	G	1	400	900	8	8	9	4	..	10	.....
Standish Pipe Line Co.	Galva, Kan.	Pump	SE	G	2	400	900	8	8	9	4	...	10	.....
Rowan Drilling Co.	Fort Worth, Texas	Gen.	Sup.	D	2	400	900	8	8½	10½	4	S	....	.....
Hubbard-Knutson-Mitchell	Houston, Texas	Gen.	Sup.	D	1	400	900	8	8½	10½	4	S	....	.....
General Electric Co.	Erie, Pa.	Gen.	Sup.	D	2	400	900	6	8½	10½	4	S	....	.....
Socony-Vacuum Oil Co.	Egypt	Rig	Sup.	D	3	380	800	6	8½	10½	4	S	....	.....
Cia Azucarera del Rio	Xicotencatl, Mex.	Gen.	FIW	D	2	375	300	5	14	18	4	S	.37	None
Illinois Bell Telephone	Chicago, Ill.	Gen.	Sup.	D	2	350	600	8	9	12	4	S	....	.....
					4	325	720	8	8½	10½	4	S	....	.....
					3	250	720	6	8½	10½	4	S	....	.....
Gulf Refining Co.	Cambridge City, Ind.	Pump	BuS.	D	1	340	257	3	16¼	23	4	A	.425	.....
United Fruit Co.	Panama	Gen.	Sup.	D	1	315	700	8	8½	10½	4	S	....	.....
Interstate Oil Pipe Line Co.	Shreveport, La.	Pump	BuS.	D	2	300	260	6	13	17	4	S	.39	.....
City of Brooklyn	Brooklyn, Iowa	Gen.	FM.	D	2	300	300	4	14	17	2	S	....	.....
			Cat.	D	1	105	900	6	5¾	8	4	S	....	.....
Red River Refining Co.	Chicago, Ill.	Gen.	Sup.	D	1	300	514	8	9	12	4	S	....	.....
Sinclair Oil Co.	Venezuela	Rig	Sup.	D	3	280	800	6	8½	10½	4	S	....	.....
United Fruit Co.	Panama	Pump	Sup.	D	1	260	600	6	9	12	4	S	....	.....
United Concrete Pipe Co.	San Diego, Calif.	Gen.	Sup.	D	2	175	514	6	8½	10½	4	S	....	.....
Aurora Gasoline Co.	Detroit, Mich.	Pump	RJ	D	1	175	360	3	11	18	4	..	....	.....
Thomasville Ice & Mfg Co.	Thomasville, Ga.	Comp.	Sup.	D	1	156	360	6	9	12	4	S	....	.....
Okla. Natural Gas Co.	Minnehah, Okla.	Pump	SE	G	2	110	1200	6	5¼	6	4	..	10	.....
Barnsdall Oil Co.	Patmos, Ark.	Pump	SE	G	4	100	1100	6	5¼	6	4	..	10	.....

NOTES AND ABBREVIATIONS: * Indicates engines on order, not yet installed. † Engine operates at 4500-ft elevation. †† Engine rated in kw.

BuS—Busch-Sulzer Bros Diesel Engine Co, Cat—Caterpillar Tractor Co, CB—Cooper-Bessemer Corp, FM—Fairbanks, Morse & Co, FIW—Fulton Iron Works Co, RJ—Rathbun-Jones Engineering Co, SE—Sterling Engine Co, Sup—Superior Engine Division, National Supply Co.

CSGen—Central-station generator, Gen—Generator, Comp—Compressor, Rig—Drilling Rig. Under "Type," D is diesel; Dt is diesel, turbocharged; DF is dual fuel; G is gas engine, CG is convertible gas engine. Under "Other Capacity," D is diesel, GD is gas-diesel (high-pressure injection). Under "Fuel Injection," A is air, S is solid, or mechanical injection.

In the War Years U. S. and Canada Added 7,000,000 Hp of Hydroelectric Capacity

FIVE YEARS HAVE ELAPSED since we published our last complete hydroelectric report. In this issue, we attempt to bring the record up to date. Under the stimulus of unprecedented power demands during the war, both installed waterpower capacity and power generation in these plants increased enormously. In waterwheel design the most outstanding achievement was the installation in the U. S. of a francis turbine of record size for a head of 1000 ft.

The tables on pages 94 to 97 list important hydroelectric plants in the U. S. and Canada that have gone into operation, or that have added new units, or on which construction has started since January 1941. Most of the new capacity in the U. S., particularly that in the larger plants, has been installed by agencies of the Federal Government, particularly in the South and West. There are a few exceptions, such as the plants installed by the Pacific Gas & Electric Co. the City of Tacoma, and the Nantahala Power & Light Co.

The latter, located near Franklin, N. C., has installed a single 60,000-hp 450-rpm francis turbine designed for a maximum net head of 1000 ft. Static head on this plant is 1008 ft, the highest for any reaction turbine of its size in the world. When tested in the plant by the Gibson method this turbine developed efficiencies of 93.7% at 100% load, 93% at 75% load, and 88% at 50% load. Successful operation of this unit marks another advance in waterwheel design.

PLANT-CAPACITY INCREASE

Outside of this unit's successful operation the more important features in the waterpower field are the rapid growth of plant capacity and load. At the end of 1945 the U. S. had installed 24,000,000 hp in waterpower plants, an increase of 5,000,000 hp since 1940, as shown in Fig. 1. This is an increase of 1,000,000 hp per year for five years. Most of this capacity, as previously mentioned, was installed in plants owned and operated by government agencies, particularly those of the Federal Government. Installed since 1931, these 58 plants are listed in the table opposite and their locations are shown on the map on page 98. They are designed for an ultimate capacity of 12,500,000 hp, of which 7,000,000 hp have been installed and 1,307,000 hp are on order.

Most of these plants, particularly the more important ones, have been installed by the U. S. Bureau of Reclamation, the U. S. Corps of Engineers, and the Tennessee Valley Authority. Hydro plants built or under construction by the Bureau of Reclamation total over 6,000,000 hp ultimate capacity, of which over 3,000,000 hp have been installed and 675,000 hp are on order. Of these plants Boulder Dam, with 1,835,000 hp designed capacity and 1,435,000 in operation, has the largest installed capacity in the world.

Plants designed and built or being built by the U. S. Corps of Engineers have an ultimate capacity of over 2,300,000 hp, with 900,000 hp installed and 587,000 hp on order.

The greatest coordinated hydroelectric project in the world is the development of the Tennessee River and its tributaries by the Tennessee Valley Authority. Twenty TVA plants on this river system have an ultimate capacity of 3,350,000 hp, with 2,270,000 hp installed. These include Wilson Dam plant, which was designed and built by the U. S. Corps of Engineers during and after World War I. TVA also operates five plants owned by the Aluminum Co of America, with a total capacity of over 400,000 hp.

Fig. 2 shows curves of power generation in steam and hydro central stations and the percent of the total generated in each class. Because of the war, total power generation reached an all-time

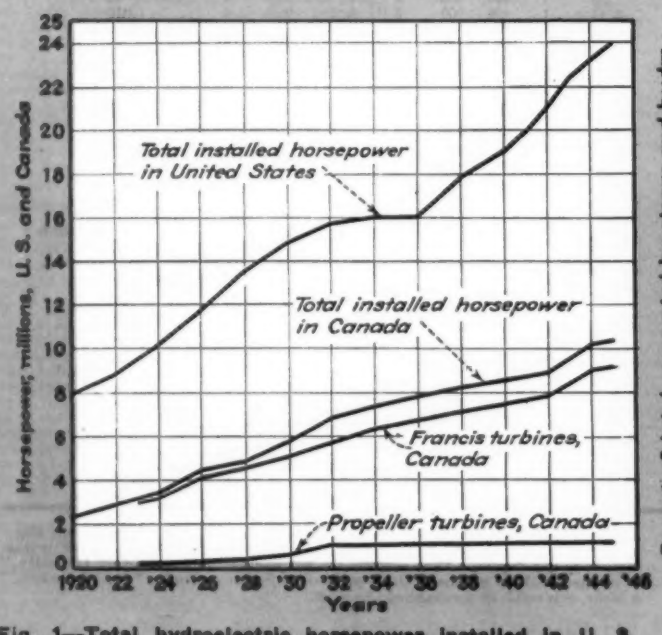

Horsepower, millions, U. S. and Canada
Total installed horsepower in United States
Total installed horsepower in Canada
Francis turbines, Canada
Propeller turbines, Canada
Years

Fig. 1—Total hydroelectric horsepower installed in U. S. and Canada during the last 25 years. In U. S. hydro power has increased almost 1,000,000 hp per year since 1936

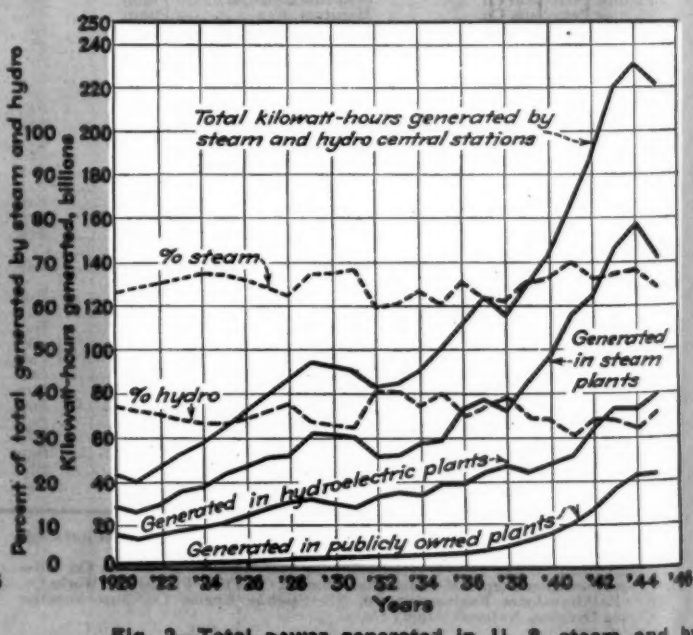

Percent of total generated by steam and hydro
Kilowatt-hours generated, billions
Total kilowatt-hours generated by steam and hydro central stations
% steam
% hydro
Generated in steam plants
Generated in hydroelectric plants
Generated in publicly owned plants
Years

Fig. 2—Total power generated in U. S. steam and hydro electric central stations, kilowatt-hours supplied by each class of plant and percent of total each class generated

high of 231 billion kwhr in 1944, almost three times that in 1932. However, in spite of the large increase in power generation, percent of power produced in hydro plants remained fairly constant, between 30 and 40% of total generation. Because of a decrease in total load combined with fairly high rainfall last year hydro plants took an increased share and reached 80-billion kwhr. This almost equaled total central-station generation, 82-billion kwhr in 1932, at the bottom of the business depression.

Waterpower has been and remains the mainspring of Canada's industrial development. About 98% of her 40-billion kwhr annual generation in central stations is hydroelectric. As shown on the curves, Fig. 1, she has 10,250,000 hp installed, nearly 2,000,000 of which was installed during the five war years that this report covers. Of this, 1,140,000 hp were installed in a single plant which has the world's highest-powered single group of hydroelectric units in operation. This plant was built in record time to supply power for war production of aluminum.

Four 53,000-hp units were added to the Beauharnois plant on the St. Lawrence River, increasing its installed capacity to 705,000 hp. This project is planned for over 2,000,000 hp in forty 53,000-hp units, of which 13 main units and two 8000-hp service units have been installed.

In Ontario the Hydro-Electric Power Commission of Ontario system has become one of the largest in the world. In 1945 this system and TVA each generated or purchased 12.5-billion kwhr. On the Commission's system its kilowatt load has continued to increase and in 1945 reached an all-time high of over 2,600,000 kw. To meet the expected increase in load the Commission will add 500,000 hp of new capacity in the next five years. Of this the Des Joachims project on the Ottawa River will have installed an initial 360,000-hp capacity.

HYDROELECTRIC PROJECTS CONSTRUCTED AND OPERATED BY GOVERNMENT AGENCIES

Government Agency	Project	State	River	Ultimate Cap., Hp	Initial Cap., Hp	Installed Hp	On Order Hp
U. S. Bureau of Reclamation	Grand Coulee	Wash.	Columbia	2,742,000	478,000	928,000	450,000
U. S. Corps of Engineers	Bonneville	Wash. & Ore.	Columbia	729,000	137,000	729,000	.....
	Anderson Ranch	Idaho	Boise	55,500	37,000	.....	37,000
	Minidoka	Idaho	Snake	26,500	9,000	19,500	.....
U. S. Bureau of Reclamation	Shasta	Calif.	Sacramento	522,000	419,000	419,000	103,000
	Keswick	Calif.	Sacramento	103,800	103,800	.....	103,800
Imperial Irrigation District	Drop No. 3	Calif.	All Am. Canal	15,000	7,500	7,500	.....
	Drop No. 4	Calif.	All Am. Canal	26,600	13,300	13,300	.....
	Parker Dam	Ariz. & Calif.	Colorado	160,000	120,000	160,000	.....
	Davis Dam	Ariz. & Calif.	Colorado	311,000	311,000	.....	.....
	Boulder Dam	Ariz. & Nev.	Colorado	1,835,000	522,000	1,435,000	.....
U. S. Bureau of Reclamation	Elephant Butte	N. M.	Rio Grande	31,500	31,500	31,500	.....
	Green Mountain	Colo.	Blue	30,000	30,000	30,000	.....
	Colo.-Big Thompson	Colo.	Colo.Big Thompson	135,000	.....	.....	.....
	Seminoe	Wyo.	N Platte	45,000	45,000	45,000	.....
U. S. Corps of Engineers	Fort Peck	Mont.	Missouri	150,000	70,000	70,000	.....
Platte Valley Pub Pr & Irr Dist	Sutherland	Neb.	N Platte	35,000	35,000	35,000	.....
Loup River Public Power Dist	Monroe	Neb.	Loup	9,600	9,600	9,600	.....
	Columbus	Neb.	Loup	54,000	54,000	54,000	.....
Central Neb. Pub Pr & Irr Dist	Jeffery Canyon	Neb.	Platte	26,000	26,000	26,000	.....
	Johnson No. 1	Neb.	Platte	26,000	26,000	26,000	.....
	Johnson No. 2	Neb.	Platte	50,000	25,000	25,000	.....
U. S. Corps of Engineers	Norfolk	Ark.	North Folk	168,000	42,000	42,000	.....
	Narrows	Ark.	Little Missouri	36,000	21,000	.....	.....
Grand River Dam Authority	Pensacola Dam	Okla.	Grand	100,000	80,000	100,000	.....
U. S. Corps of Engineers	Fort Gibson	Okla.	Grand	120,000	80,000	.....	80,000
	Dennison Dam	Okla.-Texas	Red	280,000	56,000	56,000	56,000
	Buchanan Dam	Texas	Colorado	51,900	34,600	34,600	.....
Lower Colorado River Authority	Tom Miller	Texas	Colorado	20,000	20,000	20,000	.....
	Inks Dam	Texas	Colorado	16,000	16,000	16,000	.....
	Marshall Ford	Texas	Colorado	90,000	90,000	90,000	.....
Brazos Riv Conser & Reclam Dist	Possum Kingdom	Texas	Brazos	51,000	34,000	34,000	.....
U. S. Corps of Engineers	Wolf Creek	Ky.	Cumberland	414,000	207,000	.....	207,000
Tennessee Valley Authority	Kentucky	Ky.	Tennessee	220,000	176,000	176,000	.....
	Pickwick	Tenn.	Tennessee	288,000	96,000	192,000	.....
	Wilson	Ala.	Tennessee	610,000	260,000	470,000	.....
	Wheeler	Ala.	Tennessee	360,000	90,000	180,000	.....
	Guntersville	Ala.	Tennessee	136,000	102,000	102,000	.....
	Hales Bar	Tenn.	Tennessee	41,000	41,000	41,000	.....
	Chickamauga	Tenn.	Tennessee	144,000	108,000	108,000	.....
	Watts Bar	Tenn.	Tennessee	210,000	126,000	210,000	.....
	Norris	Tenn.	Clinch	132,000	132,000	132,000	.....
	Fort Loudoun	Tenn.	Tennessee	176,000	88,000	88,000	.....
	Cherokee	Tenn.	Holston	166,000	83,000	83,000	.....
	Douglas	Tenn.	French Broad	166,000	83,000	83,000	.....
	S Holston	Tenn.	S Holston	41,500	41,500	.....	.....
	Watauga	Tenn.	Watauga	55,000	55,000	.....	.....
	Fontana	N.C.	Little Tennessee	274,000	183,000	183,000	.....
	Apalachia	Tenn.	Hiwassee	106,000	106,000	106,000	.....
	Hiwassee	N. C.	Hiwassee	160,000	80,000	80,000	.....
	Chatuge	N. C.	Hiwassee	10,700	10,700	.....	.....
	Nottely	Ga.	Nottely	13,400	13,400	.....	.....
	Ocoee No. 3	Tenn.	Ocoee No. 3	33,500	33,500	33,500	.....
U. S. Corps of Engineers	Central Hill	Tenn.	Carney Fork	207,000	138,000	.....	138,000
	Dale Hollow	Tenn.	Obey	75,000	50,000	.....	50,000
	Allatoona	Ga.	Etowah	152,900	102,900	.....	102,900
S. Carolina Public Service Auth	Santee-Cooper	S. C.	Santee	213,000	173,000	173,000	.....
Greenwood County Board of Comm	Buzzards	S. C.	Saluda	30,000	22,200	22,200	.....

Hydroelectric Projects Built or on Order i

Compiled by F A Annett
Associate Editor

Company or Government Agency	Design Engineers	Project Name	[1] New or Redevelopment	River	State or Province	Project Started	[2] Dam Type	Crest Length, Feet	Max Height, Feet	Initial Operation	Added Cap. No. of Units
NEW ENGLAND STATES											
Public Electric Light Co		Woods Falls	New		Vt.	1946	....	.....	...	1947	
Bangor Hydro-Electric Co	Bangor Hydro-Electric Co	Milford No. 2	New	Penobscot	Me.	1941	CG	1,000	15	1942	
Maine Public Service Co	Green & Wilson	Squa Pan	New	Aroostook	Me.	1940	C&E	600	45	1942	
Woodstock Electric Co	Chas T Main, Inc	Taftsville	Re	Ottaquechee	Vt.	1942	CG	227	20	1943	
Village of Enosburg Falls	Chas T Main, Inc	No. 1	Re	Missisquoi	Vt.	1943	CG	240	20	1944	
Commonwealth of Massachusetts	Metropolitan Dist Water-Supply Comm	Windsor Dam	New	Swift	Mass.	1927	Earth	2,640	170	1946	
Self-Locking Carton Co		Palmer	New		Mass.	1945	....	.....	...	1946	
Adams Paper Co		Wells River	New		Mass.	1945	...	.....	...	1946	
Public Service Co of New Hampshire			....		N.H.	...	....	.....	...	1947	
Public Service Co of New Hampshire		Franklin	....		N.H.	....	....	.....	...	1947	
Village of Booneville			New		N.Y.	1945	....	.....	...	1946	
EAST NORTH CENTRAL STATES											
Wisconsin Michigan Power Co	Holland Ackerman & Holland	Peavy Falls	New	Michigamme	Mich.	1941	MA	366	75	1943	21
Michigan Public Service Co		Cheboygan	New		Mich.	1945	....	.....	...	1946	
City of Sturgis			New		Mich.	1946	....	.....	...	1947	1
Consolidated Water Pr & Paper Co	Thiele & Utegaard	Du Bay	New	Wisconsin	Wis.	1941	C&E	5,000	26	1942	10
Illinois Iowa Power Co		Decatur	....		Ill.	1942	....	.....	...	1943	
City of Kaukauna Elec & Wr Dept	Mead, Ward & Hunt	City	New	Fox	Wis.	1939	CG	2,328	8.5	1940	3
Northern Indiana Brass Co			New		Ind.	1945	....	.....	...	1946	
Kimberly Clark Corp		Niagara Mill	....		Wis.	....	....	.....	...	....	
Wisconsin Public Service Corp	Public Utility Engrg & Service Corp	Grand Rapids	Re	Menominee	Mich.	....		Replaces old 4-runner unit			
Clam River Dam Co		Grantsburg	New		Wis.	1940	....	.....	...	1941	1
Village of Gresham	Orbonson & Orbonson	Gresham	New	Red	Wis.	....	CG	150	16	1945	
Village of Merrillan		Merrillan	New		Wis.	1940	....	.....	...	1941	
City of Allegan	Ayers, Lewis, Harris & May	Kalamazoo	New	Kalamazoo	Mich.	1930	CG	235	16	1936	2
City of Black River Falls			New	Black	Wis.	1946	....	.....	...	1947	
SOUTH ATLANTIC STATES											
Nantahala Power & Light Co	Aluminum Company of Am	Nantahala	New	Nantahala	N.C.	1940	R&E	1,050	250	1942	60
Tennessee Valley Authority	Tennessee Valley Authority	Fontana	New	Little Tenn.	N.C.	1942	CG	2,385	480	1945	180
Tennessee Valley Authority	Tennessee Valley Authority	Chatuge	New	Hiwassee	N.C.	1941	EF	2,850	144	....	10
Tennessee Valley Authority	Tennessee Valley Authority	Nottely	New	Nottely	Ga.	1941	R&E	2,300	184	....	12
U. S. Engineer Corps	U. S. Engineer Corps	Allatoona	New	Etowah	Ga.	1946	CG	1,325	200	1949	102
U. S. Engineer Corps	U. S. Engineer Corps	St. Lucie	New	St. Lucie Canal	Fla.	1941	Gates	522	22	1944	
Blanche Cotton Mills					Ga.	....	....	.....	...	1946	
Pendleton Mfg Co			New		S.C.	1941	....	.....	...	1942	
Graniteville Co		Sibley Div	New		S.C.	....	....	.....	...	1941	
EAST SOUTH CENTRAL STATES											
Tennessee Valley Authority	Tennessee Valley Authority	Kentucky	New	Tennessee	Ky.	1938	CGE	8,412	206	1944	176
Tennessee Valley Authority	Tennessee Valley Authority	Pickwick Landing	New	Tennessee	Tenn.	1935	CGE	7,715	113	1938	90
Tennessee Valley Authority	U. S. Engineer Corps Hugh L Cooper & Co	Wilson	New	Tennessee	Ala.	1918	CGG	4,500	95	1926	200
Tennessee Valley Authority	Tennessee Valley Authority	Watts Bar	New	Tennessee	Tenn.	1939	CGE	2,960	112	1942	120
Tennessee Valley Authority	Tennessee Valley Authority	Fort Loudoun	New	Tennessee	Tenn.	1940	CGE	4,190	122	1943	80
Tennessee Valley Authority	Tennessee Valley Authority	Cherokee	New	Holston	Tenn.	1940	CGE	6,760	175	1942	80
Tennessee Valley Authority	Tennessee Valley Authority	Douglas	New	French Broad	Tenn.	1942	C&E	1,705	202	1943	80
Tennessee Valley Authority	Tennessee Valley Authority	South Holston	New	South Holston	Tenn.	1942	R&E	1,505	290	....	41
Tennessee Valley Authority	Tennessee Valley Authority	Watauga	New	Watauga	Tenn.	1942	R&E	900	318	....	50
Tennessee Valley Authority	Tennessee Valley Authority	Apalachia	New	Hiwassee	Tenn.	1941	NCG	1,308	150	1943	100
Tennessee Valley Authority	Tennessee Valley Authority	Ocoee No. 3	New	Ocoee	Tenn.	1941	NCG	612	110	1943	30
U. S. Engineer Corps	U. S. Engineer Corps Chas T Main, Inc	Dale Hollow	New	Obey	Tenn.	1942	CG	1,717	200	1947	50
U. S. Engineer Corps	U. S. Engineer Corps Chas T Main, Inc	Center Hill	New	Carney Fork	Tenn.	1942	C&E	2,160	240	1948	136
U. S. Engineer Corps	U. S. Engineer Corps Chas T Main, Inc	Wolf Creek	New	Cumberland	Ky.	1942	C&E	5,700	240	1949	207
WEST SOUTH CENTRAL STATES											
U. S. Engineer Corps	U. S. Engineer Corps Fargo Engineering Co	Fort Gibson	New	Grand	Okla.	1946	CGE	2,850	110	....	80
Grand River Dam Authority	Holway & Neuffer	Pensacola Dam	New	Grand	Okla.	1938	MA	6,100	150	1941	80
U. S. Engineer Corps	U. S. Engineer Corps L H Harza Engineering Co	Norfolk Dam	New	North Fork	Ark.	1940	CG	2,631	233	1944	42
U. S. Engineer Corps	U. S. Engineer Corps	Denison Dam	New	Red	Texas & Okla.	1939	EF	23,200	165	1945	70
U. S. Engineer Corps	U. S. Engineer Corps Fargo Engineering Co	Narrows Dam	New	Little Missouri	Ark.	....	CG	941	191	....	24
MOUNTAIN STATES											
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Boulder Dam	New	Colorado	Ariz. & Nev.	1931	GA	1,180	730	1936	515
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Anderson Ranch or Boise	New	Boise	Idaho	1941	EF	1,350	330	....	37

[1] The term "New" applies to an entirely new project on a site that has not been developed before. "Redevelopment" indicates a project on a site that has been developed before and now has new wheels, generators and setting, or a new plant.

[2] CG, concrete gravity; CA, concrete arch; CRA, resistant-radius arch; GA, gravity arch; C&E, concrete and earth; MA, multiple arch; TE, timber and earth; R&E, rock and earth fill; EF, earth fill; HEF, hydraulic earth fill; P&G, piers and gates; CGE, concrete gravity and earth fill; CGG, concrete gravity with gates, NCG, non-overflow concrete gravity.

[3] AG indicates that the thrust bearing is above generator; BG, thrust bearing located below generator; HS, a horizontal-shaft machine.

[4] EHS, elbow with horizontal splitter plate.

[5] AC—Allis-Chalmers Mfg Co
BS—Baldwin Southwark Corp

the United States and Canada in 1941-46

Added Cap. No. of Units	Date of Added Cap	Ultimate Cap. Horsepower	No. of Units Installed	Waterwheel Capacity, Horsepower	Waterwheel Type	Speed, RPM	Static Head, Feet	Design Head, Feet	Waterwheel Manufacturer	Governor Manufacturer	Draft-Tube Type	Scroll-Case Type	Penstock-Valve Type	Generator Capacity, Kva	Thrust-Bearing Location	Power Factor	Kilovolts	Cycles	Generator Manufacturer
....	....	8,100	1	8,100	Kaplan	200	52	52	MS	W	Elbow	Concrete	Head gt	6,250	AG	0.80	4.16	60	GE
1	1943	4,260	1	2,130	Kaplan	120	17	17	MS	W	Elbow	Concrete	Head gt	2,000	AG	0.80	4.15	60	GE
			1	2,130	Kaplan	120	17	17	MS	W	Elbow	Concrete	Head gt	2,000	AG	0.80	4.15	60	GE
....	....	2,000	1	2,000	.....	200	25	25	MS	W	Elbow	Concrete	Head gt	1,875	AG	0.80	2.4	60	GE
....	....	670	1	670	Kaplan	257	20	20	MS	W	Elbow	Concrete	Head gt	625	AG	0.80	4.15	60	GE
....	....	.....	1	845	Kaplan	225	23	23	MS	W	Elbow	Concrete	Head gt	750	AG	0.80	2.4	60	GE
....	....	1,700	1	1,700	Francis	600	155	140	MS	W	Conical	Cast ir	Head gt	1,500	AG	0.80	2.4	60	EM
		.....	1	395	Francis	225	21	21	JL	W	Elbow	Concrete	Head gt	312	AG	0.80	0.60	60	WE
....	....	.....	1	395	Francis	360	27	27	JL	W	Elbow	Concrete	Head gt	312	HS	0.80	0.24	60	WE
....	....	.....	1	.....	.....	128.5	.....	...	.....	..	.....	.....	.....	18,750	BG	0.80	6.9	60	GE
....	....	.....	1	.....	.....	200	.....	...	.....	..	.....	.....	.....	7,500	BG	0.80	4.16	60	WE
....	....	.....	1	350	Francis	327	22	22	JL	W	Elbow	.....	Head gt	250	HS	0.80	2.4	60	GE
....	....	21,400	2	10,700	Francis	200	100	95	AC	W	Elbow	Plate st	Head gt	7,500	BG	1.00	6.6	60	AC
....	....	.....	1	1,610	Kaplan	1,125	14	14	AC	W	Elbow	Concrete	Head gt	1,250	BG	0.90	2.4	60	AC
....	....	1,600	1	1,600	Francis	138.5	26	26	JL	W	Elbow	Concrete	Head gt	1,500	AG	0.80	2.4	60	AC
....	....	10,850	3	3,000	Prop	150	25	25	JL	W	Elbow	Concrete	Head gt	2,500	AG	0.80	4.16	60	GE
			1	1,850	Prop	180	25	25	JL	W	Elbow	Concrete	Head gt	1,500	AG	0.80	4.16	60	GE
....	....	770	1	770	Francis	83.7	16	16	JL	W	Elbow	Concrete	Head gt	500	AG	0.80	2.4	60	GE
1	1942	6,600	1	3,300	Kaplan	138.5	22	22	MS	W	Elbow	Concrete	Head gt	3,000	AG	0.80	2.4	60	EM
			1	3,300	Kaplan	138.5	22	22	MS	W	Elbow	Concrete	Head gt	3,000	AG	0.80	2.4	60	EM
....	....	.....	1	95	Prop	227	12	12	JL	W	Conical	.....	Head gt	93.8	AG	0.80	2.4	60	GE
....	....	.....	1	1,400	Francis	240	68	65	MS	W	.....	.....	.....	.....	...	....	.....	..	.....
			1	1,700	Francis	150	29	29	MS	W	Plate st	.....	Head gt	1,500	HS	0.80	2.3	60	GE
....	....	1,170	2	585	Francis	270	35	35	JL	W	Elbow	Concrete	Head gt	500	AG	0.80	2.4	60	EM
....	....	.....	1	150	Francis	360	31	31	JL	W	Elbow	Concrete	Head gt	125	AG	0.80	2.3	60	EM
....	....	.....	1	123	Francis	257	18	18	JL	W	Conical	.....	Head gt	93.5	...	0.80	2.3	60	EM
1	1945	4,040	1	2,020	Francis	120	18	18	JL	W	Elbow	Concrete	Head gt	1,500	AG	0.80	2.3	60	GE
			1	2,020	Francis	120	18	18	JL	W	Elbow	Concrete	Head gt	1,500	AG	0.80	2.3	60	GE
....	....	.....	1	925	Francis	138.5	22	22	JL	W	Elbow	Concrete	Head gt	750	AG	0.80	2.4	60	WE
....	....	60,000	1	60,000	Francis	450	1,005	950	NN	W	Elbow	Cast st	Butterfly	54,000	AG	0.80	13.2	60	GE
....	....	274,000	2	91,500	Francis	150	429–244	330	AC	AC	Elbow	Plate st	Head gt	75,000	BG	0.90	13.8	60	WE
....	....	10,700	1	10,700	Francis	.....	124–56	95	.....	..	Elbow	.....	Head gt	8,900	...	0.90	13.8	60	.....
....	....	13,400	1	13,400	Francis	.....	169–79	125	.....	..	Elbow	.....	Head gt	11,100	...	0.90	13.8	60	.....
....	....	152,900	2	50,000	Francis	112.5	153–105	135	MS	W	Elbow	Plate st	Head gt	40,000	BG	0.90	13.8	60	WE
			1	2,900	Francis	450	153–105	135	JL	W	Service unit		.....	2,500	AG	0.80	2.4	60	WE
....	....	145	1	145	.....	240	9–19	15	MS	W	Conical	.....	.....	94	AG	0.80	0.2	60	WE
....	....	.....	1	.....	.....	150	.....	...	.....	..	.....	.....	.....	375	AG	0.80	0.60	60	GE
....	....	.....	1	185	Francis	257	17	17	JL	W	.....	.....	Head gt	180	AG	0.80	0.60	60	WE
....	....	.....	1	900	Francis	225	36	36	JL	W	Elbow	Concrete	Head gt	750	AG	0.80	0.60	60	WE
			1	1,080	Francis	200	36	36	JL	W	Elbow	Concrete	Head gt	875	AG	0.80	0.60	60	WE
....	....	220,000	4	44,000	Kaplan	78.3	57–20	48	AC	AC	Elbow	Concrete	Head gt	35,000	BG	0.90	13.8	60	GE
2	1942	288,000	2	48,000	Kaplan	81.8	63–29	47	AC	AC	Elbow	Concrete	Head gt	40,000	BG	0.90	13.8	60	WE
			2	48,000	Kaplan	81.8	63–29	47	AC	AC	Elbow	Concrete	Head gt	40,000	BG	0.90	13.8	60	WE
			4	30,000	Francis	100	95	92	BS	BS	Elbow	Concrete	Head gt	24,000	AG	0.90	13.8	60	WE
4	1942	610,000	4	35,000	Francis	100	95	92	NN	W&L	Elbow	Concrete	Head gt	28,000	AG	0.90	13.8	60	GE
2	1943		4	35,000	Francis	100	95	92	AC	W	Elbow	Concrete	Head gt	28,000	AG	0.90	13.8	60	AC
			2	35,000	Francis	100	95	92	AC	W	Elbow	Concrete	Head gt	28,000	AG	0.90	13.8	60	AC
2	1944	210,000	3	42,000	Kaplan	94.7	60–40	52	BS	W	Elbow	Concrete	Head gt	33,333	BG	0.90	13.8	60	WE
			2	42,000	Kaplan	94.7	60–40	52	BS	W	Elbow	Concrete	Head gt	33,333	BG	0.90	13.8	60	WE
....	....	176,000	2	44,000	Kaplan	105.8	60–78	65	BS	W	Elbow	Concrete	Head gt	35,550	BG	0.90	13.8	60	AC
....	....	166,000	2	41,500	Francis	94.7	150–55	100	MS	W	Elbow	Plate st	Head gt	33,333	BG	0.90	13.8	60	GE
....	....	166,000	2	41,500	Francis	94.7	129–47	100	MS	W	Elbow	Concrete	Head gt	33,333	BG	0.90	13.8	60	GE
....	....	41,500	1	41,500	Francis	.....	252–126	180	.....	..	.....	.....	.....	33,333	BG	0.90	13.8	60	.....
....	....	55,000	2	27,500	Francis	.....	.....	190	.....	..	.....	.....	.....	27,778	BG	0.90	13.8	60	.....
....	....	106,000	2	53,000	Francis	225	380	360	BS	W	Elbow	Cast st	Butterfly	40,000	BG	0.90	13.8	60	WE
....	....	33,500	1	33,500	Francis	200	300	280	MS	W	Elbow	Plate st	Butterfly	26,667	BG	0.90	13.8	60	WE
....	....	75,000	2	25,000	Francis	163.6	118–151	140	MS	W	Elbow	Plate st	Head gt	20,000	BG	0.90	13.2	60	WE
			1	1,305	Francis	720	118–151	140	JL	W	Service unit		.....	1,000	AG	0.80	2.4	60	WE
....	....	207,000	2	69,000	Francis	105.9	206–134	160	.....	..	Elbow	Plate st	Head gt	50,000	...	0.90	13.8	60	GE
....	....	414,000	3	69,000	Francis	105.9	214–111	160	.....	..	Elbow	Plate st	Head gt	50,000	...	0.90	13.8	60	GE
....	....	120,000	4	20,000	Francis	100	63	61	.....	..	Elbow	Concrete	Head gt	13,666	BG	0.90	13.8	60	.....
			4	20,000	Francis	150	135–85	115	AC	W	Elbow	Plate st	Head gt	16,000	BG	0.90	13.8	60	WE
		100,000	1	750	Francis	720	135–85	115	AC	W	Elbow	Cast st	Head gt	625	HS	0.80	0.48	60	WE
1	1945		1	20,000	Francis	150	135–85	115	AC	W	Elbow	Plate st	Head gt	16,000	BG	0.90	13.8	60	WE
....	....	168,000	1	42,000	Francis	128.5	202–132	160	MS	W	Elbow	Plate st	Head gt	38,889	BG	0.90	13.8	60	WE
			1	540	Francis	720	202–132	160	JL	W	Elbow	Service unit		500	AG	0.80	0.48	60	WE
			1	56,000	Francis	90	113–75	103	MS	W	Elbow	Plate st	Head gt	43,000	BG	0.95	13.8	60	WE
1	1947	283,080	2	1,540	Francis	90	113–75	103	JL	W	Elbow	Service unit		750	AG	0.80	0.48	60	WE
			1	56,000	Francis	90	113–75	103	MS	W	Elbow	Plate st	Head gt	43,000	BG	0.95	13.8	60	WE
....	....	36,000	2	12,000	Francis	225	159–100	132	.....	..	Elbow	Plate st	Head gt	9,444	...	0.90	13.8	60	.....
			8	115,000	Francis	180	584–422	520	6AC 2PW	W W	Elbow	Cast st	Butterfly	82,500	AG	1.00	16.5	60	4 WE 4 GE
			1	55,000	Francis	237	.....	520	NN	W	Elbow	Cast st	Butterfly	40,000	AG	1.00	13.8	60	AC
1	1941	1,835,000	2	3,500	Impulse	300	.....	520	PW	W		House service		3,000	HS	0.80	2.4	60	EM
1	1942		1	115,000	Francis	180	.....	520	BS	W	Elbow	Cast st	Butterfly	82,500	AG	1.00	16.5	60	WE
1	1942		1	115,000	Francis	180	.....	520	BS	W	Elbow	Cast st	Butterfly	82,500	AG	1.00	16.5	60	WE
1	1944		1	115,000	Francis	180	.....	520	AC	W	Elbow	Cast st	Butterfly	82,500	AG	1.00	16.5	60	GE
			1	115,000	Francis	180	.....	520	BS	W	Elbow	Cast st	Butterfly	82,500	AG	1.00	16.5	60	GE
....	....	55,500	2	18,500	Francis	277	.....	245	JL	W	Elbow	Cast st	Butterfly	15,000	AG	0.90	6.9	60	WE

JL —James Leffel & Co
MS —S Morgan Smith Co
NN —Newport News Shipbuilding & Dry Dock Co
PW —Pelton Water Wheel Co
W —Woodward Governor Co
CAC —Canadian Allis-Chalmers, Ltd

DEW—Dominion Engineering Works, Ltd
MSC —S Morgan Smith, Canada, Ltd
MSI —S Morgan Smith-Inglis, Ltd
EM —Electric Machinery Mfg Co
GE —General Electric Co
WE —Westinghouse Electric Corp

CGE —Canadian General Electric Co, Ltd
CWC—Canadian Westinghouse Co, Ltd
EEC —English Electric Co of Canada, Ltd
OC —Oerlikon, Canada, Ltd
SGE —Swedish General Electric Co, Ltd

Hydroelectric Projects Built or on Order in the

Compiled by F A Annett
Associate Editor

Company or Government Agency	Design Engineers	Project Name	[1] New or Redevelopment	River	State or Province	Project Started	[2] Dam Type	Crest Length, Feet	Max Height, Feet	Initial Operation	Initial Horsepower	Added Cap. No. of Units	Date of
MOUNTAIN STATES—*Continued*													
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Davis Dam	New	Colorado	Ariz. & Calif.	1941	R&E	1,600	135	....	311,000	...	...
U. S. Engineer Corps	U. S. Engineer Corps Harza Engineering Co	Fort Peck	New	Missouri	Mont.	1934	HEF	21,000	250	1943	50,000	1	194
Idaho Power Co	Ebasco Services, Inc	Upper Salmon	New	Snake	Idaho	1945	....	3,300	...	1946	.....	...	...
Moon Lake Elec Assoc	.....	Alta Mont	New	.....	Utah	1940	....	.....	...	1941	1,020	1	194
St George City Corp	.....	.....	New	.....	Utah	1941	....	.....	...	1943	.....	...	...
City of Beaver	.....	.....	New	.....	Utah	1940	....	.....	...	1942	.....	...	...
PACIFIC COAST STATES													
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Grand Coulee	New	Columbia	Wash.	1934	CG	4,500	553	1941	478,000	3	1943
												3	1947
U. S. Engineer Corps	U. S. Engineer Corps	Bonneville	New	Columbia	Wash. & Ore.	1933	CG	900	170	1938	137,000	2	194
												2	194
												4	1942
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Shasta	New	Sacramento	Calif.	1938	CG	3,500	560	1944	213,000	...	...
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Keswick	New	Sacramento	Calif.	1941	CG	1,050	120	1947	103,800	3	194
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Parker	New	Colorado	Calif. & Ariz.	1934	CA	800	340	1942	80,000	...	...
Pacific Power & Light Co	.....	Deschutes	....	Crooked	Ore.	....	Rock	.....	...	....	2,270	2	194
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Deschutes	New unit installed by USBR in Pacific Power & Light Co's plant (above)									1	194
Tacoma Pub Utilities Dept	Dept Engrg Staff	Alder	New	Nisqually	Wash.	1942	CRA	1,589	330	1945	69,000	...	...
Tacoma Pub Utilities Dept	Dept Engrg Staff	LaGrande	Re	Nisqually	Wash.	1910 1942	CG	710	215	1912	32,000	1	194
Pacific Gas & Electric Co	Pacific Gas & Electric Co	Narrows	New	Yuba	Calif.	1941	CA	1,142	237	1942	13,500	...	...
Pacific Gas & Electric Co	Pacific Gas & Electric Co	Dutch Flat	New	Bear	Calif.	1940	CA	324	100	1943	29,000	...	...
Pacific Gas & Electric Co	Pacific Gas & Electric Co	Pit No. 5	New	Pit	Calif.	1941	CG	340	60	1943	200,000	...	...
California Oregon Power Co	Public Utility Engrg & Service Corp	Prospect No. 4	New	Rogue	Ore.	1943	....	.....	...	1944	1,400	...	...
Pacific Portland Cement Co	.....	Gold Hill	New	.....	Ore.	1942	....	.....	...	1943	2,200	...	...
CANADA													
Avon River Power Co, Ltd	Montreal Engrg Co, Ltd	Hollow Bridge	New	Black	N.S.	1939	....	.....	...	1940	7,500	...	...
Avon River Power Co, Ltd	Montreal Engrg Co, Ltd	Lumsden	New	Black	N.S.	1941	EF	750	80	1942	4,500	...	...
Town of Berwick	.....	Berwick	Re	Factorydale	N.S.	1945	CG	.....	...	1946	.....	...	...
Aluminum Company of Canada, Ltd	H G Acres & Co	Shipshaw No. 2	New	Saguenay	Que.	1941	CG	3,300	200	1942	1,140,000	...	...
Quebec Hydro-Electric Comm Beauharnois Lt Ht & Pr Co	.....	Beauharnois	New	St. Lawrence	Que.	1929	P&G	4,500	31	1932	440,000	1 2 2	19 19 19
Shawinigan Water & Power Co	Shawinigan Engrg Corp	Rapide Blanc	New	St. Maurice	Que.	1930	CG	.....	...	1932	160,000	1	19
St. Maurice Power Co	Shawinigan Engrg Corp	La Tuque	New	St. Maurice	Que.	1938	CG	1,325	131	1940	178,000	1	19
Gatineau Power Co	Shawinigan Engrg Corp	Farmers Rapids	New	Gatineau	Que.	1926	RRE	3,600	56	1927	96,000	1	19
Pembroke Electric Co	H G Acres & Co	Waltham	Re	Black	Que.	1940	....	.....	...	1941	2,200	1	19
Quebec National Elec Syndicate	Silas H Woodward	Rapid No. 7	New	Ottawa	Que.	1938	Earth	3,000	80	1941	48,000	...	...
Lower St. Lawrence Pr Co	Foundation Co of Can	Lower Metis	New	Metis	Que.	1945	CG	75	77	1946	6,000	...	...
Belleterre Quebec Mines	.....	Winneway	New	.....	Que.	1938	....	.....	...	1939	1,400	1	19
Price Bros Co, Ltd	.....	.....	....	.....	Que.	....	....	.....	...	....	.....	...	...
Chateur Bay Power Co	.....	.....	New	Hall	Que.	1943	....	.....	...	1944	.....	...	...
Ogilvie Flour Mill Co	.....	City Mill	New	Lachine Canal	Que.	1940	....	.....	...	1941	800	...	...
Hydro-Elec Pr Comm of Ont	Hydro-Elec Pr Comm of Ont	Barrett Chute	New	Madawaska	Ont.	1940	CG	1,200	97	1942	56,000	...	...
Hydro-Elec Pr Comm of Ont	Hydro-Elec Pr Comm of Ont	Decew Falls Ext	New	Welland Canal	Ont.	1941	None	.....	...	1943	72,000	1	19
Hydro-Elec Pr Comm of Ont	Hydro-Elec Pr Comm of Ont	Stewartville	New	Madawaska	Ont.	1945	CG	1,300	200	1947	56,000	...	...
Hydro-Elec Pr Comm of Ont	Hydro-Elec Pr Comm of Ont	Alexander	New	Nipigon	Ont.	1926	EF	750	90	1930	54,000	1	19
Hydro-Elec Pr Comm of Ont	Hydro-Elec Pr Comm of Ont	Big Eddy	New	Muskoka	Ont.	1940	CG	491	36	1941	9,900	...	...
Hydro-Elec Pr Comm of Ont	Hydro-Elec Pr Comm of Ont	Sills Island	Re	.....	Ont.	....	....	.....	...	....	.....	...	...
Great Lakes Power Co	Harza Engrg Co	Upper Falls	New	Montreal	Ont.	1936	EF	775	32	1937	10,000	1	19
Great Lakes Power Co	Harza Engrg Co	Lower Falls	New	Montreal	Ont.	1937	....	1,400	32	1939	10,900	1	19
Great Lakes Power Co	.....	.....	....	.....	Ont.	....	....	.....	...	1943	.....	...	...
Kalamazoo Vegetable Parchment Co	H G Acres & Co	Espanola	Re	Spanish	Ont.	1944	....	.....	...	1946	10,000	...	...
City of Winnipeg	Winnipeg Engrg Dept	Slave Falls	New	Winnipeg	Man.	1929	....	.....	...	1931	.....	1 1 2 2	19 19 19 19
Calgary Power Co	Montreal Engrg Co	Cascade	New	Cascade	Alt.	1941	EF	1,900	116	1942	23,000	...	...
Calgary Power Co	Montreal Engrg Co	Barrier	New	Kananaskis	Alt.	1945	EF	1,800	150	1946	13,500	...	...
Powell River Co	W B Scoular	Lois River	New	Lois	B.C.	1929	CA	640	170	1931	24,000	1	19
Consolidated Mining & Smelting Co	.....	Brilliant	New	Kootenay	B.C.	1942	....	.....	...	1944	74,000	...	...
British Columbia Power Comm	H G Acres & Co	Campbell River	New	Campbell	B.C.	1945	CG	2,900	140	1947	56,000	...	...
British Columbia Power Comm	G P Moe	Shuswap Falls	New	Shuswap	B.C.	1928	....	125	85	1929	3,800	1	19
Yukon Consolidated Gold Co	.....	.....	....	.....	.....	....	....	.....	...	....	.....	...	...
Consolidated Mining & Smelting Co	Bennett & White Const Co	Snare	New	Yellowknife	N.W.T.	1940	....	.....	...	1941	4,700	...	...

[1] The term "New" applies to an entirely new project on a site that has not been developed before. "Redevelopment" indicates a project on a site that has been developed before and now has new wheels, generators and setting, or a new plant.

[2] CG, concrete gravity; CA, concrete arch; CRA, constant-radius arch; GA, gravity arch; C&E, concrete and earth; MA, multiple arch; TE, timber and earth; R&E, rock and earth fill; EF, earth fill; HEF, hydraulic earth fill; P&G, piers and gates; CGE, concrete gravity and earth fill; CGG, concrete gravity with gates, NCG, non-overflow concrete gravity.

[3] AG indicates that the thrust bearing is above the generator; BG, thrust bearing located below the generator; HS, a horizontal-shaft machine.

[4] EHS, elbow with horizontal splitter plate.

[5] AC—Allis-Chalmers Mfg Co
BS —Baldwin Southwark Corp

the United States and Canada in 1941-46

Added Cap, No. of Units	Date of Added Cap	Ultimate Cap, Horsepower	No. of Units Installed	Waterwheel Capacity, Horsepower	Waterwheel Type	Speed, RPM	Static Head, Feet	Design Head, Feet	[1] Waterwheel Manufacturer	[1] Governor Manufacturer	Draft-Tube Type	Scroll-Case Type	Poustock-Valve Type	Generator Capacity, Kva	[1] Thrust-Bearing Location	Power Factor	Kilovolts	Cycles	[1] Generator Manufacturer
....	....	311,000	5	62,200	Francis	94.7	139	125	.....	..	Elbow	Plate st	Head gt	45,000	AG	1.00	13.8	60	GE
....	....	150,000	1	50,000	Francis	128.5	120–205	170	MS	W	Moody	Plate st	Butterfly	38,889	BG	0.90	13.8	60	AC
1	1946	.....	1	20,000	Francis	164	120–205	140	MS	W	Moody	Plate st	Butterfly	16,667	BG	0.90	13.8	60	AC
....	....	23,000	2	11,500	Francis	112.5	26	35	BS	W	Elbow	Concrete	Head gt	9,000	AG	0.90	6.9	60	GE
....	....	1,530	2	510	Francis	1,200	260	250	JL	W	Elbow	.....	Head gt	375	HS	0.80	2.4	60	GE
1	1944		1	510	Francis	1,200	260	250	JL	W	Elbow	.....	Head gt	375	HS	0.80	2.4	60	GE
....	....	610	1	610	Impulse	1,200	900	855	PW	W	.....	.....	.....	625	HS	0.80	2.4	60	WE
....	....	750	1	750	Impulse	450	.....	350	PW	W	.....	.....	.....	625	HS	0.80	6.9	60	WE
....	....	2,742,000	3	150,000	Francis	120	368	300	NN	W	Elbow	Cast st	Head gt	108,000	AG	1.00	13.8	60	WE
			2	14,000	Francis	400	368	335	PW	W		Service units		12,500	AG	0.80	2.4	60	WE
3	1943–4		3	150,000	Francis	120	368	300	NN	W	Elbow	Cast st	Head gt	108,000	AG	1.00	13.8	60	WE
3	1947–8		3	150,000	Francis	120	368	300	NN	W	Elbow	Cast st	Head gt	108,000	AG	1.00	13.8	60	WE
....	....	729,000	2	66,000	Kaplan	75	67–22	50	MS	W	[4] EHS	Concrete	Head gt	54,000	BG	0.80	13.8	60	GE
....	....		1	5,000	Kaplan	275	67–22	50	MS	W	Elbow	Plate st	Head gt	3,200	AG	0.80	2.4	60	EM
2	1940		2	74,000	Kaplan	75	67–22	50	MS	W	[4] EHS	Concrete	Head gt	60,000	BG	0.80	13.8	60	GE
2	1941		2	74,000	Kaplan	75	67–22	50	MS	W	[4] EHS	Concrete	Head gt	60,000	BG	0.80	13.8	60	GE
4	1942–3		4	74,000	Kaplan	75	67–22	50	MS	W	[4] EHS	Concrete	Head gt	60,000	BG	0.80	13.8	60	GE
....	....	522,000	2	103,000	Francis	150	480–243	330	AC	AC	Elbow	Plate st	Head gt	75,000	AG	1.00	13.8	60	GE
3	1947		2	3,500	Francis	600		330	JL	W	Conical	Cast st	.....	2,500	AG	0.80	2.4	60	GE
....	....	103,800	3	103,000	Francis	150		330	AC	AC	Elbow	Plate st	Head gt	75,000	AG	1.00	13.8	60	GE
....	....	160,000	3	34,600	Francis	94.7	100	100	MS	W	Elbow	Concrete	Head gt	25,000	AG	1.00	6.9	60	GE
2	1943		2	40,000	Francis	94.7	87–60	80	MS	W	Elbow	Plate st	Head gt	30,000	AG	1.00	6.9	60	WE
			2	40,000	Francis	94.7	87–60	80	MS	W	Elbow	Plate st	Head gt	30,000	AG	1.00	6.9	60	WE
....	....	4,410	2	1,135	Francis	.....	35–30	34	...	..	.....	.....	.....	1,000	HS	....	.....	..	.....
1	1943	.....	1	2,140	Francis	240	35–30	34	MS	W	Elbow	Concrete	Head gt	1,875	AG	0.8	2.4	60	EM
....	....	.....	2	34,500	Francis	225	275–179	273	PW	W	Elbow	Welded st	Butterfly	25,000	AG	1.00	13.8	60	GE
....	....	87,000	4	8,000	Francis	450	424–398	415	AC	W	Elbow	Cast st	Butterfly	6,000	HS	1.00	6.6	60	AC
1	1945		1	55,000	Francis	257	424–398	415	PW	W	Elbow	Cast st	Butterfly	40,000	AG	1.00	13.8	60	GE
....	....	13,500	1	13,500	Francis	300	185–240	200	BS	PW	Elbow	Cast st	Butterfly	11,000	AG	0.85	11.0	60	WE
....	....	29,000	1	29,000	Francis	400	655–627	596	PW	W	Elbow	Cast st	Butterfly	27,500	AG	0.80	11.0	60	AC
....	....	200,000	4	50,000	Francis	300	630–615	630	PW	W	Elbow	Cast st	Butterfly	40,000	AG	0.80	11.5	60	2GE 2WE
....	....	1,400	1	1,400	Francis	400	170	160	PW	PW	Elbow	Cast st	Butterfly	1,250	HS	0.80	2.3	60	GE
....	....	2,200	2	1,100	Prop	200	23	23	JL	W	Elbow	Concrete	Head gt	750	AG	1.00	2.4	60	GE
....	....	7,500	1	7,500	Francis	257	158–130	148	DEW	W	Elbow	Plate st	Head gt	6,250	AG	0.85	6.9	60	SGE
....	....	4,500	1	4,500	Francis	257	72	72	DEW	DEW	Elbow	Plate st	Head gt	3,500	AG	0.80	6.9	60	CWC
....	....	.....	1	320	Francis	720	.....	...	.....	W	.....	.....	.....	312	HS	0.80	9.3	60	CWC
....	....	1,140,000	8	100,000	Francis	128.5	210	208	CAC	W	Elbow	Plate st	Head gt	85,000	AC	0.80	13.2	60	7 CWC
			4	85,000	Francis	128.5	210	208	MSC	W	Elbow	Plate st	Head gt	75,000	AG	0.80	13.2	60	5 CGE
....	....	636,000	4	53,000	Francis	75	83	80	DEW	DEW	Elbow	Concrete	Head gt	43,886	BG	0.85	13.2	25	1 OC 3 CGE
....	....		4	53,000	Francis	75	83	80	DEW	DEW	Elbow	Concrete	Head gt	46,625	BG	0.90	13.2	60	CGE
			2	8,000	Francis	180	83	80	DEW	DEW	Elbow	Concrete	Head gt	7,200	...	0.80	13.2	60	CGE
1	1939		1	53,000	Francis	75	83	80	DEW	DEW	Elbow	Concrete	Head gt	46,625	BG	0.90	13.2	60	CGE
2	1940		2	53,000	Francis	75	83	80	DEW	DEW	Elbow	Concrete	Head gt	43,886	BG	0.85	13.2	25	CGE
2	1941		2	53,000	Francis	75	83	80	DEW	DEW	Elbow	Concrete	Head gt	46,625	BG	0.90	13.2	60	CGE
....	....	240,000	4	40,000	Francis	109.1	117–93	108	DEW	DEW	Moody	Plate st	Head gt	36,000	BG	0.85	11.0	60	CWC
1	1943		1	40,000	Francis	109.1	117–93	108	DEW	DEW	Moody	Plate st	Head gt	36,000	BG	0.85	11.0	60	CWC
....	....	267,000	4	44,500	Francis	109.1	114–104	114	DEW	DEW	Elbow	Plate st	Head gt	40,000	AG	0.90	11.0	60	CGE
1	1943		1	44,500	Francis	109.1	114–104	114	DEW	DEW	Elbow	Plate st	Head gt	40,000	AG	0.90	11.0	60	CGE
....	....	120,000	3	24,000	Francis	90	66	66	DEW	W	Moody	Concrete	Head gt	25,000	AG	0.85	6.6	60	CGE
....	....		1	24,000	Francis	88	66	66	DEW	W	Moody	Concrete	Head gt	22,500	AG	0.90	6.6	25	CGE
1	1947		1	24,000	Francis	90	66	66	DEW	W	Moody	Concrete	Head gt	25,000	AG	0.85	6.6	60	CGE
....	....	4,700	1	2,200	Francis	514	125	125	JL	W	Steel Cone	Cast st	.....	1,800	HS	0.85	2.5	60	CWC
1	1945		1	2,500	Francis	360	125	125	MSC	W	Steel Cone	Plate st	Head gt	2,250	HS	0.85	2.5	60	CWC
....	....	64,000	3	16,000	Francis	115.4	52–71	68	DEW	W	Elbow	Concrete	Head gt	15,000	BG	0.80	13.8	25	CWC
....	....	6,000	1	6,000	Francis	200	75	75	MSC	W	Elbow	Plate st	Head gt	5,000	AG	0.85	4.16	60	CWC
....	....	2,800	1	1,400	Francis	257	54	54	CAC	W	Elbow	Concrete	Head gt	1,375	HS	0.80	2.3	60	EEC
1	1942		1	1,400	Francis	257	54	54	CAC	W	Elbow	Concrete	Head gt	1,375	HS	0.80	2.3	60	EEC
			1	.....	.....	240	.....	...	.....	..	.....	.....	.....	1,500	HS	0.80	6.9	60	EEC
....	....	.....	1	550	.....	900	.....	...	.....	..	.....	.....	.....	438	HS	0.80	2.3	60	CWC
....	....	.....	2	400	Prop	257	17	17	DEW	..	.....	Flume	Head gt	375	...	0.80	2.3	60	CWC
....	....	56,000	2	28,000	Francis	163.6	157–143	154	CAC	W	Elbow	Plate st	Head gt	24,000	AG	0.85	13.2	60	CGE
....	....	147,000	1	72,000	Francis	150	275–267	265	CAC	CAC	Elbow	Plate st	Head gt	48,500	AG	0.85	13.2	25	CGE
1	1947		1	75,000	Francis	166.7	275–267	265	CAC	W	Elbow	Plate st	Head gt	64,000	AG	0.85	13.2	25	CGE
....	....	56,000	2	28,000	Francis	163.6	131–155	148	CAC	W	Elbow	Plate st	Head gt	24,000	AG	0.85	13.2	60	CGE
....	....	73,000	3	18,000	Francis	100	65–56	58	MSI	W	Elbow	Concrete	Head gt	15,000	AG	0.85	12.0	25	CGE
1	1945		1	19,000	Prop	150	65–56	58	DEW	W	Elbow	Concrete	Head gt	15,000	AG	0.90	12.0	60	CGE
....	....	9,900	2	4,950	Prop	200	40–35	36	MSI	W	Elbow	Concrete	Head gt	4,500	AG	0.85	6.6	60	CWC
....	....	.....	1	New generator on old vertical-shaft wheel								.....	.....	1,200	BG	0.80	6.6	60	CGE
....	....	20,000	1	10,000	Francis	277	190	186	MSI	W	Elbow	Concrete	Head gt	9,000	BG	0.90	11.0	60	CGE
1	1942		1	10,000	Francis	277	190	186	MSC	W	Elbow	Concrete	Head gt	9,000	BG	0.90	11.0	60	CGE
....	....	21,800	1	10,900	Francis	257	205	200	MSI	W	Elbow	Concrete	Head gt	10,000	BG	0.90	11.0	60	CGE
1	1942		1	10,900	Francis	257	205	200	MSC	W	Elbow	Concrete	Head gt	10,000	BG	0.90	11.0	60	CGE
....	....	.....	1	.....	.....	65.4	.....	...	.....	..	.....	.....	.....	1,800	AG	0.80	2.3	60	CGE
....	....	.....	1	10,000	Francis	144	64	64	CAC	W	Elbow	Hydraucone	Head gt	7,500	AG	0.80	2.4	60	CWC
....	....	96,000	2	12,000	Prop	94.7	33–22	30	DEW	W	Moody	Concrete	Head gt	10,000	AG	1.00	6.6	60	SGE
1	1937		1	12,000	Prop	94.7	33–22	30	DEW	W	Moody	Concrete	Head gt	10,000	AG	1.00	6.6	60	SGE
1	1938		1	12,000	Prop	94.7	33–22	30	DEW	W	Moody	Concrete	Head gt	10,000	AG	1.00	6.6	60	SGE
2	1946		2	12,000	Prop	94.7	33–22	30	DEW	W	Moody	Concrete	Head gt	10,000	AG	1.00	6.6	60	CGE
2	1947		2	12,000	Prop	94.7	33–22	30	DEW	W	Moody	Concrete	Head gt	10,000	AG	1.00	6.6	60	CGE
....	....	23,000	1	23,000	Francis	100	345–310	325	DEW	W	Elbow	Steel	Butterfly	20,000	AG	0.85	13.2	60	CWC
....	....	48,000	1	13,500	Francis	225	151–126	135	DEW	DEW	Elbow	Plate st	Head gt	11,250	AG	0.85	13.2	60	CWC
1	1947		1	24,000	Francis	333.3	425–300	375	DEW	W	Moody	Plate st	Johnson	18,000	AG	0.80	6.6	50	CGE
....	....		1	24,000	Francis	333.3	425–300	375	DEW	W	Moody	Plate st	Johnson	18,000	AG	0.80	6.6	50	CGE
....	....	150,000	2	37,000	Francis	100	100	90	DEW	..	Elbow	Plate st	Head gt	32,000	AG	0.85	13.2	60	CWC
....	....	7,800	2	28,000	Francis	327.3	480–394	390	DEW	W	Elbow	Plate st	Butterfly	25,000	AG	0.80	17.8	60	CWC
1	1943		1	3,800	Francis	200	72–82	77	AC	AC	Elbow	Plate st	Head gt	3,000	AG	0.80	2.3	60	WE
			1	4,000	Francis	257	72–82	77	CAC	W	Conical	Plate st	Head gt	3,500	AG	0.80	2.3	60	CGE
....	....	.....	1	.....	.....	514	.....	...	.....	..	.....	.....	.....	4,000	HS	0.85	2.3	60	CWC
....	....	.....	1	4,700	Francis	360	100	100	CAC	..	.....	.....	.....	4,200	HS	0.80	2.3	60	CWC

—James ... el & Co
—S Morg... Smith Co
—Newpo... News Shipbuilding & Dry Dock Co
—Pelton ...ater Wheel Co
—Woodw... l Governor Co
AC—Canadi... Allis-Chalmers, Ltd

DEW—Dominion Engineering Works, Ltd
MSC—S Morgan Smith, Canada, Ltd
MSI—S Morgan Smith-Inglis, Ltd
EM—Electric Machinery Mfg Co
GE—General Electric Co
WE—Westinghouse Electric Corp

CGE—Canadian General Electric Co, Ltd
CWC—Canadian Westinghouse Co, Ltd
EEC—English Electric Co of Canada, Ltd
OC—Oerlikon, Canada, Ltd
SGE—Swedish General Electric Co, Ltd

Location and Capacity of Government Hydro Projects

LEGEND

BR...U.S. BUREAU OF RECLAMATION
US...U.S. ENGINEER CORPS
II...IMPERIAL IRRIGATION DISTRICT
PV...PLATTE VALLEY PUBLIC POWER AND IRRIGATION DISTRICT
LR...LOUP-RIVER PUBLIC POWER DISTRICT
CN...CENTRAL-NEBRASKA PUBLIC POWER AND IRRIGATION DISTRICT
GD...GRAND-RIVER DAM AUTHORITY
LC...LOWER COLORADO RIVER AUTHORITY
BD...BRAZOS-RIVER CONSERVATION AND RECLAMATION DISTRICT

TVA PROJECTS

LEGEND

A...KENTUCKY, 220,000 HP ULTIMATE, 176,000 HP INSTALLED
B...PICKWICK, 288,000 HP ULTIMATE, 192,000 HP INSTALLED
C...WILSON, 610,000 HP ULTIMATE, 470,000 HP INSTALLED
D...WHEELER, 360,000 HP ULTIMATE, 180,000 HP INSTALLED
E...GUNTERSVILLE 136,000 HP ULTIMATE, 102,000 HP INSTALLED
F...HALES BAR 44,000 HP ULTIMATE, 44,000 HP INSTALLED
G...CHICKAMAUGA, 144,000 HP ULTIMATE, 108,000 HP INSTALLED
H...WATTS BAR, 210,000 HP ULTIMATE, 210,000 HP INSTALLED
I...NORRIS, 132,000 HP ULTIMATE, 132,000 HP INSTALLED
J...FORT LOUDOUN, 176,000 HP ULTIMATE, 98,000 HP INSTALLED
K...CHEROKEE, 166,000 HP ULTIMATE, 83,000 HP INSTALLED
L...S. HOLSTON, 41,500 HP ULTIMATE
M...WATAUGA, 53,000 HP ULTIMATE
N...DOUGLAS, 166,000 HP ULTIMATE, 83,000 HP INSTALLED
O...FONTANA, 274,000 HP ULTIMATE, 183,000 HP INSTALLED
P...APALACHIA, 106,000 HP ULTIMATE, 106,000 HP INSTALLED
Q...HIWASSEE, 160,000 HP ULTIMATE, 80,000 HP INSTALLED
R...CHATUGE, 10,700 HP ULTIMATE,
S...NOTTELY, 13,400 HP ULTIMATE, 13,400 HP INSTALLED
T...OCOEE NO 3, 33,500 HP ULTIMATE, 33,500 HP INSTALLED

Atomic Control Plan Hailed As Masterful Achievement

Lilienthal Committee's report recommends international monopoly of 'dangerous' activities, maximum freedom for 'safe' activities including power plants using denatured materials

CHAIRMAN DAVID E LILIENTHAL

With few dissenting voices, editorial commentators have hailed the "Report on the International Control of Atomic Energy," prepared for the Secretary of State's Committee on Atomic Energy by a board of consultants, as the most statesmanlike and practical plan yet suggested to promote the peaceful use of atomic energy, while avoiding world-wide destruction by atomic weapons.

None but the International-Atomic Authority would be permitted to operate such "dangerous" activities as mining and stockpiling uranium ores, refining the metal, concentrating U235, and operating large piles to produce plutonium. At the same time the plan would promote national and private operation of such "safe" activities as running small research reactors to make isotopes for medical and research purposes, and even operating larger power piles using denatured plutonium and U235. The plan calls for gradual release of atomic secrets over a period of years under such an arrangement that a nation not playing fair cannot avoid revealing its hand to the world at least a year before it can produce atomic weapons.

The 30,000-word report addressed to Dean Acheson, Under Secretary of State, is State Dept Pub 2498, obtainable from Supt of Documents, Washington 25, D. C. 20¢. Authors are: David E Lilienthal, chairman of TVA; Chester I Barnard, pres, N. J. Bell Telephone Co; Dr J Robert Oppenheimer, Calif. Inst Technology and University of Calif.; Dr Chas Allen Thomas, vice-pres and technical director, Monsanto Chemical Co; Harry A Winne, vice-pres, in charge of engineering policy, General Electric Co.

Report on International Control of Energy

The following highly condensed summary of the Lilienthal Report makes no attempt to adhere to the original text.—Ed

INTRODUCTION

▶ THE COMMITTEE VISITED the plants at Oak Ridge, Tenn., and Los Alamos, N. M., and conferred with many scientists and engineers. This report is a result of much work, observation and deliberation. It is not a final blueprint, but a foundation on which a satisfactory plan can be built. We invite discussion.

SECTION I: BACKGROUND OF THE PROBLEM

The "agreed declaration" of Nov. 15, 1945, issued by the U. S. President and the Prime Ministers of the United Kingdom and Canada, cites three reasons for international control of atomic energy: (1) Atomic energy gives the world an unprecedented means of destruction; (2) there can be no adequate military defense against atomic weapons; (3) no one nation can long maintain a monopoly of atomic-energy facilities and know-how.

Controlling atomic weapons is terribly difficult. The need is equally great. If the United Nations cannot solve this problem, it cannot long survive.

Some have proposed simply to "outlaw" atomic bombs, but this is not so easy as it seems. Many developments of atomic energy could serve equally for peace or war. A national agreement not to develop atomic energy into bombs has no more than the questionable value of the pledged word and good faith of nations.

Thus, no system of security without enforcement by an international agency offers any hope. Yet inspection and police methods will never work if potentially dangerous activities are permitted under the claim (right or wrong) that they are intended only for peaceful ends.

Every stage from raw materials to weapons must be controlled. A large and highly qualified staff will be needed. The controlling Authority must be active in research and development and as well informed as the operators. These conditions cannot be fulfilled by an inspection organization of the police type—say, the equivalent of prohibition agents.

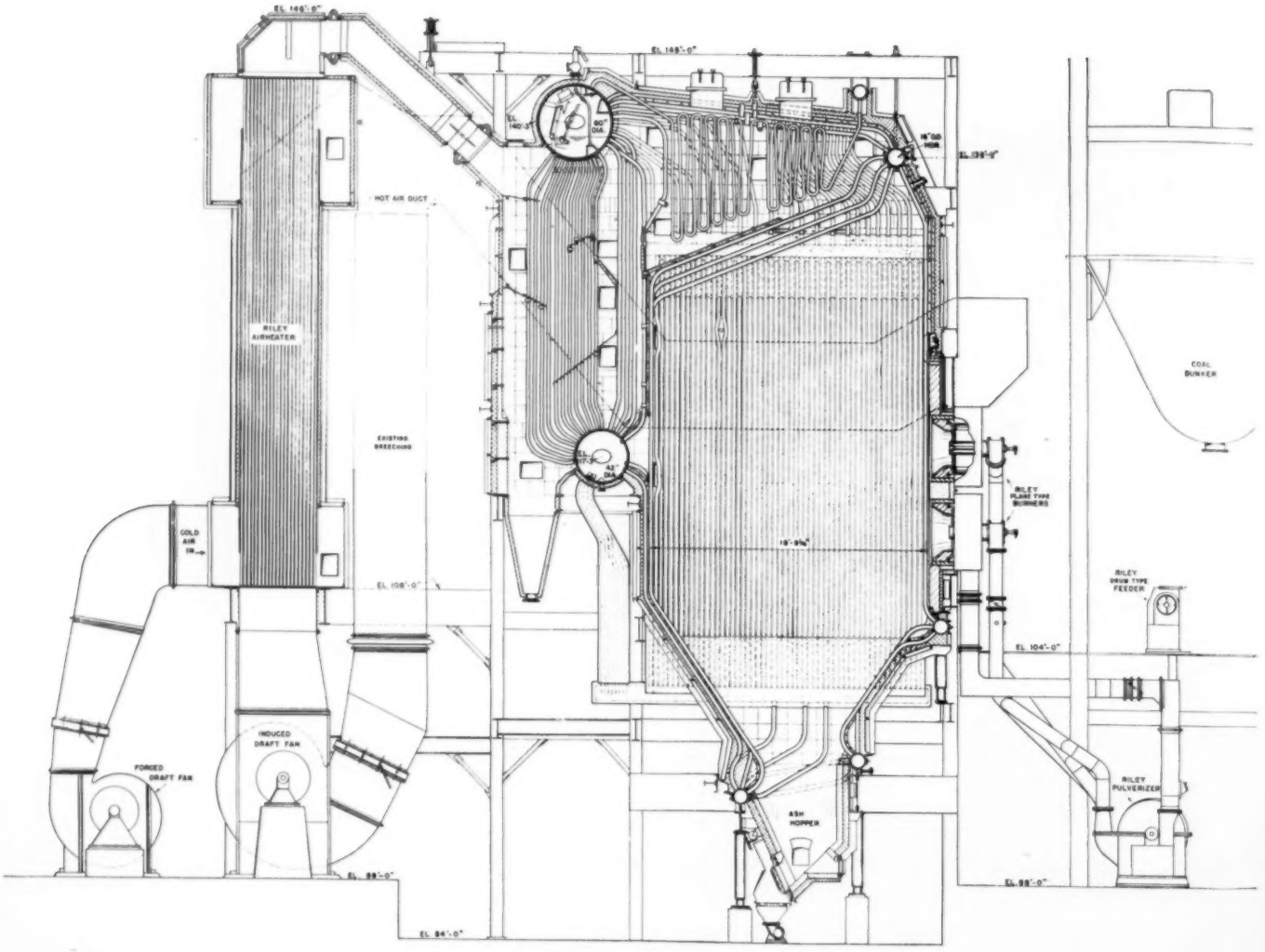
Moreover, a police type of inspection and control, with "foreigners" constantly prying into every angle of personal, corporate and governmental affairs, would create endless friction, and break down for this reason.

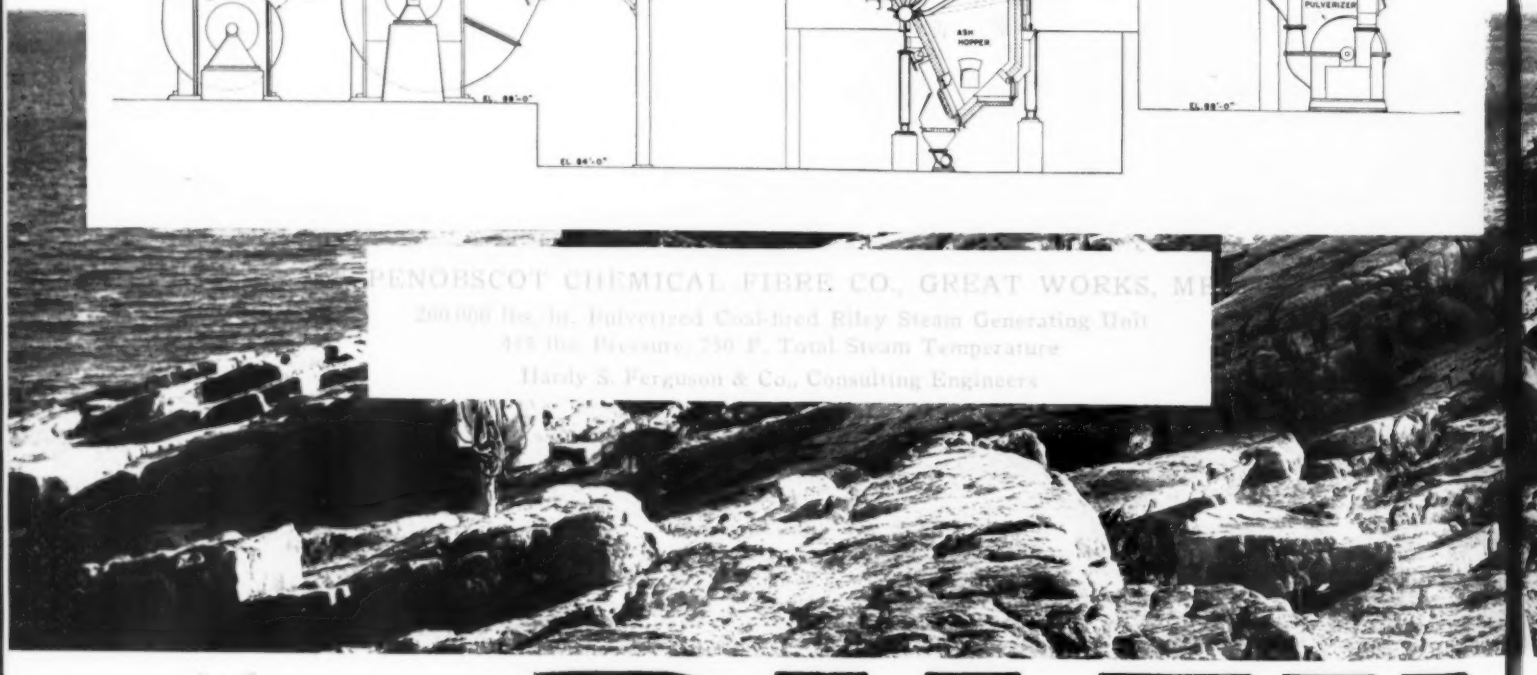
In short, any system based on merely outlawing the purely military applications of atomic energy, and relying solely on inspection for enforcement, would surely fail. Inspection can be effective only if the inspection needed is limited in scope and difficulty.

SECTION II: DEVELOPING A SYSTEM OF SAFEGUARDS

A practical plan must (1) reduce enforcement to manageable proportions; (2) provide reliable danger signals in ample time if any nation takes a step toward atomic warfare; (3) provide interim security to the U. S. if the plan fails, or if the whole international situation collapses; (4) not be wholly negative and suppressive; (5) be flexible

This modern Riley Unit making





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The Riley Steam Generating Unit recently installed by the Penobscot Chemical Fibre Company at Great Works, Maine, is causing a great deal of comment among Maine engineers because of its excellent performance. The unit is one of the most outstanding boiler installations in Maine and is making boiler history down east. It is one of the largest boiler units in the State of Maine.

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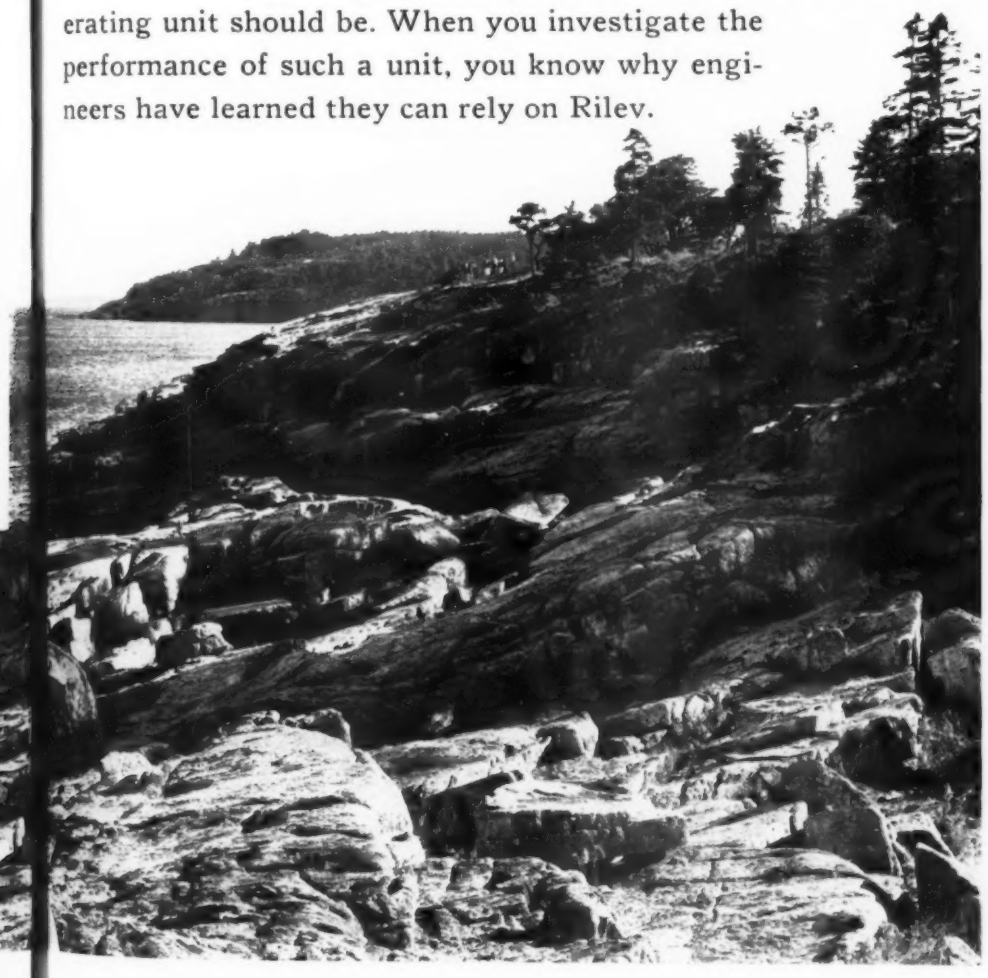
At normal operating loads, the unit operates at an efficiency of 87.5%. This unit is a good example of what a modern steam generating unit should be. When you investigate the performance of such a unit, you know why engineers have learned they can rely on Rilev.



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Dow Chemical Co. (6th order)
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New Departure Div. General Motors Corp.
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Owens Corning Fiberglass Co. (2nd order)
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Mississippi Power Co. (2nd order)
A. E. Staley Mfg. Co.
Republic Creosoting Co. (5th order)
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Packard Motor Car Co.
Carbide & Carbon Chemical Corp. (8th order)
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enough to cope with new dangers not now evident; (6) involve positive international action and minimize dangerous atomic rivalry between nations.

URANIUM IS THE KEY

Uranium is the only natural substance that can maintain a chain reaction. It is the key to all foreseeable applications of atomic energy. This fact is fundamental to our plan.

Thorium alone cannot maintain a chain reaction. However, uranium mixed with large amounts of thorium can. Such reactions can produce an atomic explosive. Therefore, controls over thorium will double-check any loopholes in the control of uranium. No other materials need to be controlled, at least in the near future.

Inspectors should not be "policemen," but creative individuals encouraged to study and develop in the field of atomic energy. Under the most favorable conditions the peril of atomic energy can be averted only by drawing upon the best human resources of good will, imagination and ingenuity. International competition for uranium and thorium resources could become far more intensive than that for oil.

There can also be competition in equipment. Take the case of a controlled "reactor," a power pile producing plutonium. If an international agreement should bar the use of plutonium in bombs, but allow such piles for heat or power, no amount of inspection could give any real security against diverting the resulting plutonium to bombs. The only safe course is to forbid anybody except the international commission to operate such piles or conduct any other operations that might be diverted to warlike ends.

NO PRIVATE MINING OF URANIUM

No nation, corporation or individual should be allowed to prospect for or mine uranium ore, regardless of intention. This will enormously simplify the problem of detecting evasion. It is much easier to check the physical facts of mining than the state of mind or intention of the miner. The opening of a mine by any individual or nation for any purpose would be an open violation, a clear indication of intention to make atomic war.

In the same way, the operation of a plutonium-producing pile by any nation, corporation or individual would be illegal. Its discovery would be an immediate signal for punishment of the violator long before he could accumulate enough plutonium for a bomb.

The international agencies controlling atomic energy should be in the very forefront of technical confidence in this field. Otherwise they will not know enough to recognize new elements of danger, new possibilities of evasion, or the beginning of a course of development having dangerous and warlike ends in view. Therefore, the enforcing agent must also have a responsibility for developing atomic energy, for designing and operating power piles, surveying and exploring new sources of raw materials, etc.

Dangerous activities must remain a complete monopoly of the international body, but there will be other important areas where national and private institutions may safely operate. These include some fields of great promise.

ROOM FOR PRIVATE EXPLOITATION

For example, uses of small quantities of plutonium and U235 are not dangerous. Also safe is the use of U235 and plutonium in denatured form. Such denatured materials are not easily converted to atomic explosives, yet are effective for the peacetime applications of atomic energy. Denatured U235 and plutonium can be used in reactors to generate power, or in reactors serving research, and in the production of radioactive tracers.

Removing the denaturing material requires very extensive plants and operations. These are not easily hidden from inspectors.

Safe activities include the application of radioactive material as tracers in scientific, medical and engineering studies.

ATOMIC POWER PLANTS PERMITTED

More marginal from the standpoint of safety, but still safe if suitably controlled is the development of power from the fission of denatured U235 and plutonium in high-power-level reactors operating, say, in the range from 100,000 to 1,000,000 kw. If these fissionable materials are used in installations where there is no additional uranium or thorium, they will not produce further fissionable material.

If the reactors are suitably designed, very little supervision will detect the substitution of uranium and thorium for the inert material in the reactor. To convert the denatured U235 or plutonium in such reactors to atomic weapons it would be necessary to close down the reactors, decontaminate the material and chemically separate it (a complex undertaking) from its denaturant. It would be difficult for such operations to escape detection.

However, for every kilowatt generated in such safe reactors, another kilowatt must be generated in dangerous reactors, making the fissionable material for the former. Thus, if atomic power is in fact developed on a large scale under this plan, about half of it will inevitably become an international monopoly; the other half may be available for competitive exploitation.

Plan requires international monopoly of uranium and dangerous supplies

SECTION III: SECURITY FROM INTERNATIONAL COOPERATION

The Atomic-Development Authority must have the right to own and lease property, to mine and manufacture, to conduct research, license, inspect, sell, etc. Its staff must come from many nations. Its functions should attract a high caliber of personnel.

The authority would take over all uranium and thorium mines and stockpiles and such production plants as Hanford and Oak Ridge in the U. S., and similar plants to be built in other countries—also large primary reactors operating at a high enough temperature for the efficient generation of electric power. These last, of course, are the most dangerous operations of all, since the piles directly produce materials suitable for atom bombs.

FUNCTIONS OF THE AUTHORITY

The Authority would conduct scientific research and engineering development, both alone and in cooperation with other public and private agencies. It would release denatured fissionable materials in small quantities for special non-dangerous uses. Eventually, it would license the construction and operation of power piles and furnish or lease denatured plutonium or U235 for such piles.

With the whole chain of dangerous operations made a monopoly of International Authority, it would be hard for any noncomplying nation to conceal an evasion all along the line from mining to bomb.

The needs of nations for new power sources vary not only with industrial conditions, but also with their nearness to water power, coal and petroleum. Dangerous power plants, which must be owned and operated by the Authority, could be located with some view to local

(Continued on page 152)

Congress has acted—and along these lines—since this editorial was written. If the President signs the legislation, we have taken one step forward. If he vetoes it, the voters must resolve a conflict between two branches of their government.

THE LABOR CRISIS
—*it's up to Congress*

IT HAS remained for John L. Lewis to demonstrate conclusively that, under the sponsorship of the federal government, the power of organized labor has been built up to a point where it can be used to paralyze the economic life of the nation. Therefore, in the elemental interest of self-preservation, the first order of the day is to cut down the power of organized labor to a point where irresponsible leaders no longer have the power to use it to cut down the country.

This will prove an exceedingly complicated job. The federal government, over a dozen years, has developed and buttressed the power of organized labor by many separate steps. They are interlaced in a pattern which cannot easily be unravelled.

Cutting down the power of organized labor to proper proportions will be an operation almost as delicate as brain surgery. To be successful it must impair no basic American political or economic right. It must leave intact the right of workers to organize and bargain collectively through representatives of their own choosing. It must leave intact the right to strike. But it must disassociate from the exercise of these rights opportunities for devastating abuse of the public welfare such as those demonstrated by Mr. Lewis. A meat axe is not the instrument for this operation.

Because of the complexity and delicacy of the operation to be performed it would be helpful if it could be carried out in a tranquil atmosphere. The urgency of the problem is such, however, that no time can be lost in getting at it.

Guiding Principles

However, the dangers that haste or heat will lead to serious blunders can be largely eliminated if the process of bringing the power of organized labor back within safe and reasonable bounds is governed by principles to which all fair minded people can fully subscribe.

The most important of these principles is that it is an abuse of public authority to extend special privileges to organized labor.

When in 1935 Congress passed the Wagner Labor Relations Act, one of the great buttresses of the power of organized labor, it was upon the explicit theory that organized labor was weak and needed coddling by the federal government if it were to survive, let alone grow big and strong. In the policy section of that act it was stated that "the inequality of bargaining power between employees who do not possess full freedom of association or actual liberty of contract, and employers who are organized in the corporate or other forms of ownership association substantially burdens and affects the flow of commerce . . . "

Regardless of whether or not that was a correct reflection of the situation in 1935, it bears no relation to the situation today. Under the continuous sponsorship of the federal government, the power and bulk of organized labor has waxed until today it is preposterous to regard it as the weak sister in its bargaining with employers. If, after being continuously demonstrated since V-J Day, the proposition that the pendulum of organized power has swung too far over on the side of organized labor needed any final and clinching demonstration, John L. Lewis provided it.

Changes in the Law

Translation of the principle that organized labor is no longer a weakling, requiring a diet of special privileges, into specific legislative enactments is a detailed technical operation beyond the scope of this statement. It is possible, however, to indicate some of the general lines it should follow. Here they are:

1. The duty to bargain collectively, now imposed upon employers by the Wagner Act, should also be imposed upon the leaders of organized labor who are now under no legal compulsion to bargain.

For well over a month Mr. Lewis made a complete mockery of the process of collective bargaining by refusing even to state his demands until the coal operators had approved "in principle" a plan for a miners' "health and welfare" fund which he fancied. In the meantime the country was plunged into an ever deepening crisis.

2. Unions, as well as employers, should be made liable to suit for damages for breaking their collective bargaining agreements.

A degree of responsibility commensurate with their age and power requires that unions be liable, to the extent of union funds but not the funds of individual members, for carrying out their agreements. To have it otherwise is to hold that a collective bargaining agreement is, by defi-

nition, a phoney agreement so far as the union is concerned. Outlaw strikes are the fruit of this lop-sided arrangement.

3. Employers should be given more discretion, in reinstating employees who have gone on strike than is now permitted by the Wagner Act.

The Wagner Act largely eliminates the risks involved in striking because of the requirements it imposes upon employers to take workers back when they have decided to return to work. These requirements make it virtually impossible for the employer to replace workers even if they are engaged in the most unjustifiable of strikes. At the least workers who have smashed up property and stirred up violence in the course of a strike should have no rights under the Wagner Act. How much further the Wagner Act strait-jacket should be loosened at this point should be carefully explored, and excesses encouraged by the Act should be removed.

4. The wedge which the National Labor Relations Board has driven into the orderly conduct of American industry by holding that foremen are covered by the Wagner Act should be eliminated.

The issue involved here is continuously mislabelled and confused as that of the right of foremen to organize. There is no question of the right of foremen to organize any kind of a legal organization they desire. That is their right as American citizens. The issue is whether or not the special privileges accorded by the Wagner Act, which in some circumstances has been so construed as even to prevent employers from talking with their workers, should be extended to foremen who, if American industry is to have a chance to do its duty effectively, must represent management with full loyalty and responsibility.

A member of John L. Lewis' United Mine Workers takes an oath which provides, in part, "that I will not reveal to any employer or boss the name of anyone a member of our union" and will "defend on all occasions and to the extent of my ability the members of our organization." Mr. Lewis insists that the coal operators contract to deal with foremen to be organized in a union where they will take that oath, and where their activities will be separated from the influence of employers by the barriers imposed by the Wagner Act. Such an arrangement undercuts orderly management of American industry.

5. The exemption of labor unions from the federal anti-trust laws, provided when organized labor was presumed to be weak, should be modified to take account of its vastly increased strength, and the use of this strength to destroy business enterprise and create monopoly.

As matters stand unions can run employers completely out of business by secondary boycotts and run fellow workers out of jobs in the process. An Ohio manufacturer, working with a government-certified C. I. O. union, is put out of business because A. F. of L. workers refuse to handle his products. Still the government, this time in the person of the United States Supreme Court, says that actions of this sort are above the law because Congress exempted unions from the federal anti-trust laws.

To eliminate one of the most devastating forms of restraint of trade, this exemption should be cut down forthwith by subjecting unions imposing secondary boycotts to the same penalties under the federal anti-trust laws as those to which employers doing the same thing are subjected. And the question of further narrowing the obsolete exemption of unions from the federal anti-trust laws should be fully explored.

6. The levying of special sales taxes for the exclusive benefit of unions should be prohibited by law.

As a matter of good government the right to levy consumption taxes should be reserved to the public authorities and used strictly for public purposes. As a matter of good economics, payments to workers or their organizations should be included in the payroll where they can be properly counted as part of the cost of production.

Equality Before the Law

When everything that can conceivably be accomplished by legislation has been accomplished there is no reason to believe that an ideal or even a surely workable system of industrial relations will have been devised. Many of the mainsprings of such a system lie deep in the hearts of men and far beyond the reach of legislation. There is no chance, however, of having such a system, or even a defensible system of democratic government until special privileges which tip the scales of power far on the side of organized labor are withdrawn and there is some measure of equality for employers and organized labor before the law. Though it is hard to believe it at the moment the country may come to be grateful to John L. Lewis for driving that lesson home so ruthlessly.

President, McGraw-Hill Publishing Company, Inc.

WASTE HEAT
Powers Cement Plant

As a sizable byproduct of rotary-kiln production, waste heat lends itself to power generation. Here's how this energy source is handled and controlled at the closely integrated plant of the Universal Atlas Cement Co near Northampton, Pa.

▶THROUGHOUT THE LEHIGH VALLEY, birthplace of the cement industry in America, many plants and quarries continue production at full scale. On a site near Northampton, Pa., where the first rotary kiln to revolutionize the cement industry in America began its test runs, stands Universal Atlas Cement Co's modern and closely integrated plant. Into its design and equipment went the latest refinements in the industry, including recent practice in waste heat for power generation.

In such a modern plant using rotary kilns, operation roughly follows this pattern: Raw cement material, mainly limestone mixed with varying proportions of sand, shale, iron, etc, depending upon qualities desired in the finished product, comes into contact with radiant and convection heat released in burning coal or oil within a kiln. Hot gas formed by this combustion affords a source of heat energy that can be harnessed to produce byproduct power. Here at Northampton three of the four rotary kilns in operation have waste-heat boilers in the discharge path of kiln gas.

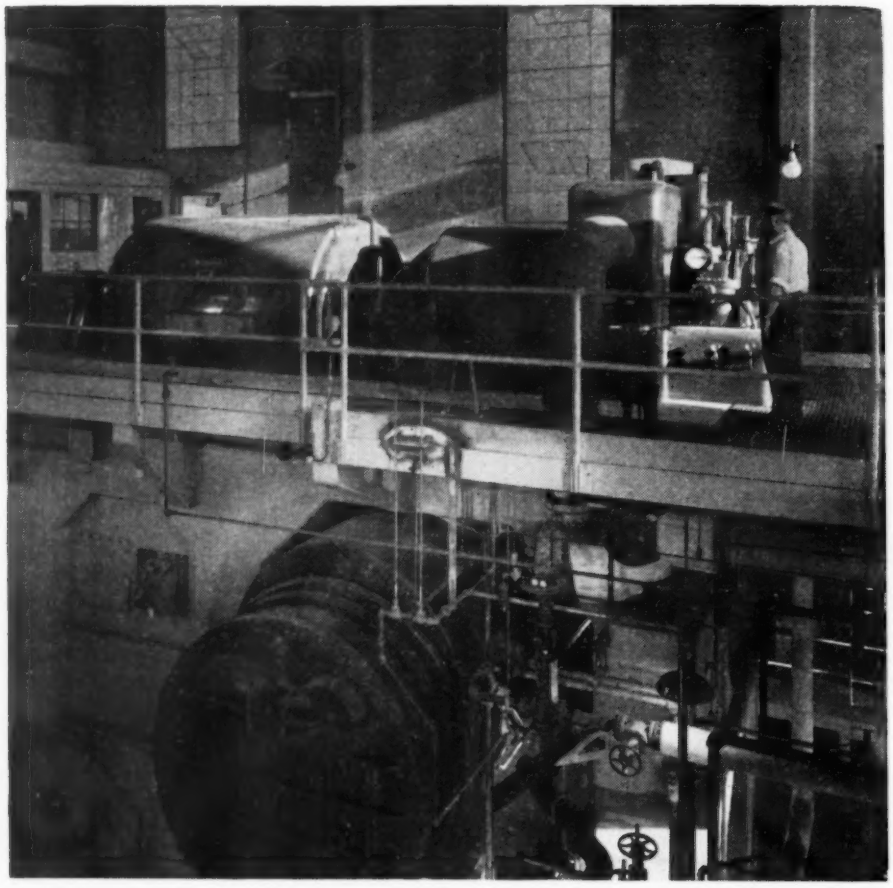
These three kilns, 10 ft 6 in. dia and 250 ft long, have refractory-lined shells and at 75 ft from the discharge end a manhole to aid in servicing and maintaining kiln-lining. At the kiln "front" (discharge end) a firing hood, which contains coal and air supplies, covers the kiln. At the opposite or feed end two operations occur: (1) Kiln gas discharges into a waste-heat boiler and (2) raw-cement material enters.

RAW-MATERIAL CHANGE

This raw material appears at the feed end of the inclined kiln as a still-wet filter cake. From this point the caked material moves down along the refractory-lined interior, progressively losing its moisture content and volatile, and undergoing a chemical reaction which forms clinkers at the front end. There these clinkers drop through a brickwork chute into an air-quenching clinker-cooler. An extension of this same brickwork forms a firing hood. This hood houses (1) the watercooled blast pipe which discharges a mixture of primary air and pulverized coal (2) a baffle that creates separate paths for discharged cement clinker and secondary air entering the hood from the clinker-cooler (3) recording radiation pyrometer for clinkering temperature readings (4) hot air intake for a coal-drier pulverizer.

Each of these unit pulverizers, of roll-on-ring design, delivers about 12,000 lb per hr maximum of bituminous coal at a fineness of about 85% through a 200-mesh screen. On each unit a pocket-wheel feeder under manual control supplies coal to its pulverizer. Rate of pocket-wheel delivery may be varied as kiln needs dictate. Under present conditions this control seems flexible enough.

Combustion Products. Preheated air for primary combustion and coal drying comes through the brickwork of the kiln



Turbine-room view shows turbine and condenser equipment for one 5000-kw machine. Regulating valve for bypass control appears in foreground above condenser shell

firing hood. To safeguard against any possibility of pre-ignition from too-hot preheated air, an atmospheric air damper in the pulverizer air intake operates to hold a safe temperature for the coal-to-air mix leaving the pulverizer.

Air and entrained pulverized coal enter the kiln firing hood through a blast pipe. There this mixture meets secondary air coming up from the clinker-cooler as combustion occurs. Under the pull of an induced-draft fan, the combustion products move up through the kiln countercurrent to the heavier raw cement particles flowing down. Each kiln discharges its gas into its own waste-heat steam generator through interconnecting flues. No ducts connect one boiler to another.

WASTE-HEAT BOILERS

Designed to supply 28,000 lb of 270-psi 556-F steam per hr with a gas supply from kilns of 1100 F, each of these waste-heat steam generators includes a boiler element, a superheater and an economizer. Kiln exit gas entering these units passes through three rows of tubes that act as a slag screen, through a 5-row bare superheater-tube section, then the boiler-tube area of the waste-heat boiler itself, into and through a bare-tube economizer to the induced-draft fan and stack.

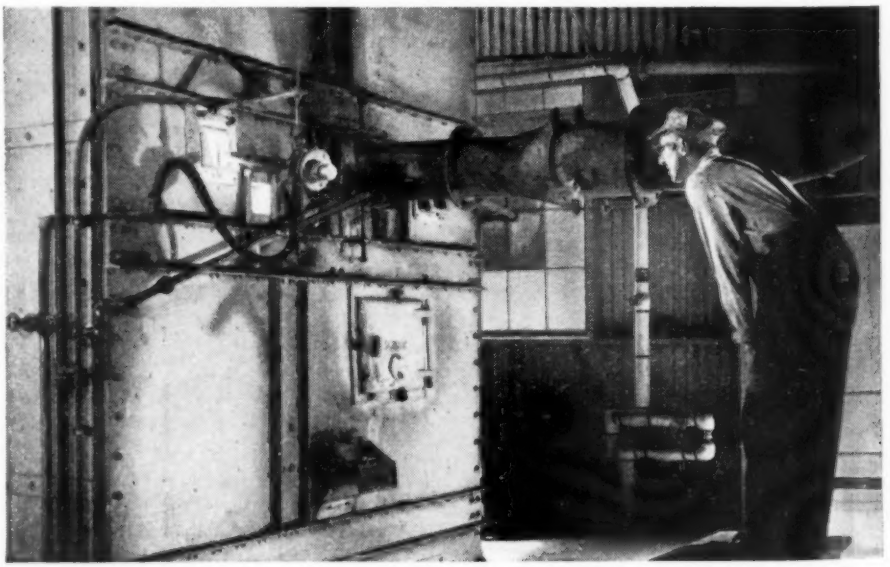
Operating experience indicates that much of the cement kiln dust borne by this flue gas deposits itself within the first ten rows of boiler tubes. Practically all tubes, including these ten rows, are hand lanced frequently (through access holes) to insure a clean surface. Slag or dust removed within boilers falls through a hopper into a screw conveyor for dust removal.

Since the waste-heat boiler serves merely to make byproduct steam from kiln gas, its control must be tied to the operation of the connected kiln.

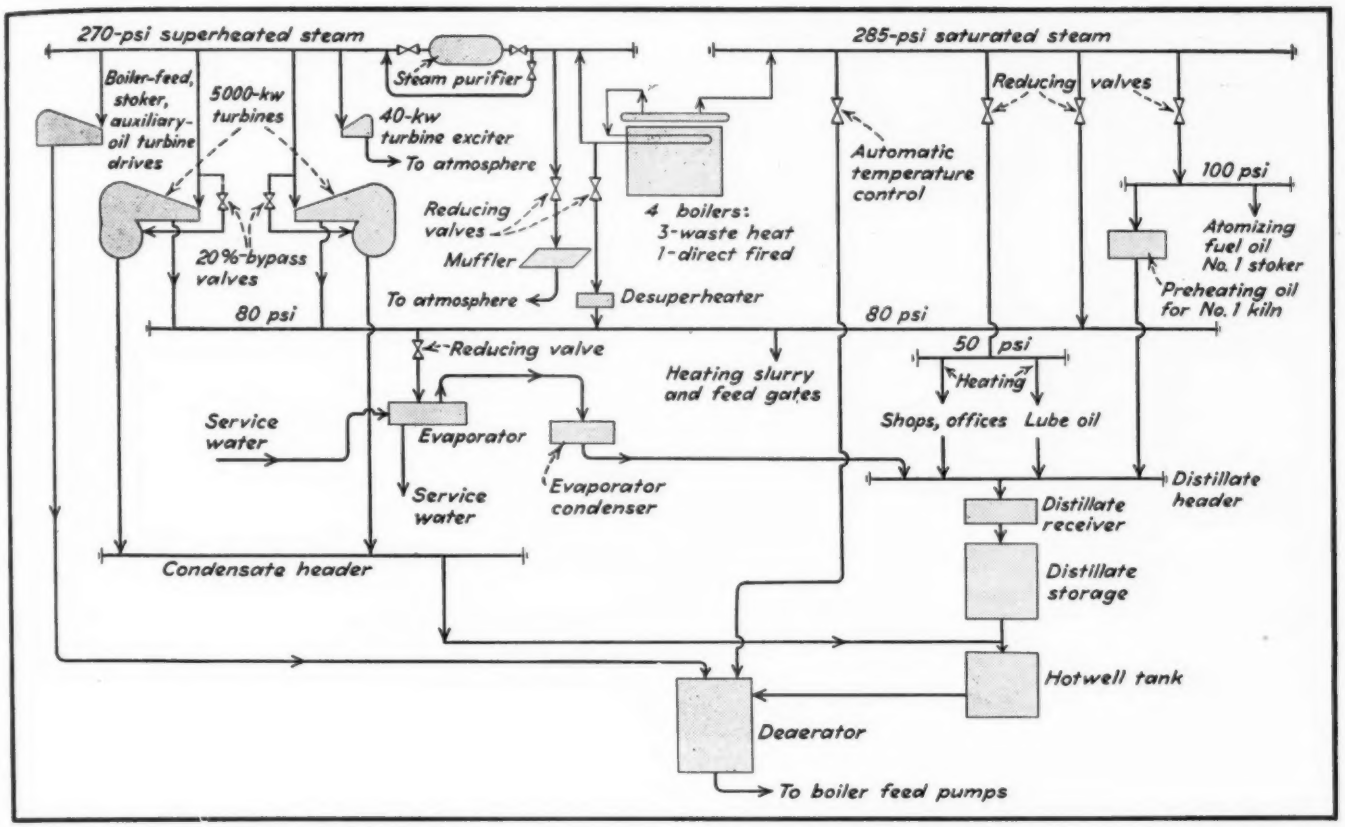
Two methods of kiln operation may be employed: (1) constant kiln speed with small variations in firing rate to fit the heat requirements of the material (2) constant firing rate with small variations in kiln speeds to meet heat needs for the material under process. The necessity of preventing mud-ring formation and of facilitating a uniform raw-material flow through the kiln makes variable firing at a constant speed the desirable method from the cement-making standpoint. Instruments indicate or record kiln conditions and aid operators to make any needed firing adjustments.

For instance, the operator must maintain uniform combustion within the kiln. One acceptable method in kilns not tied to waste-heat boilers comes from keeping a constant pressure differential between kiln back-housing and firing hood. With waste-heat boilers in the kiln gas-exit path, added considerations of (1) erosion-free tube operation and (2) design-imposed temperature limitations for the discharged waste gas require a constant check that this combustion balance exists.

Operation Checks. Northampton employs either of these devices as a check on proper combustion balance (1) constant temperature differential or (2) con-



Inspection of rotary-kiln fire on gray-cement production. Electronic pyrometer shows on left withdrawn from its entry port. Pulverized coal enters at the right



Major steam-pressure lines within the plant and services they supply are depicted in this general flow diagram. This device indicates the scope of control and maintenance necessary for proper operation of steam-service equipment.

Superheated steam header runs the length of a 500-ft service tunnel before entering turbine room proper. At the entrance point of this tunnel into the turbine room the steam purifier indicated above removes entrained moisture

stant excess air at the kiln back-housing. In the first method thermocouples at the kiln back-housing and just ahead of the waste-heat boiler tubes show the temperature drop between these points. Any deviation from the established combustion conditions changes this temperature relation, indicating to the operator an unbalanced combustible-to-air ratio.

The second method is now used on one kiln, which is controlled to hold 0.6% free oxygen at the kiln back-housing. An oxygen analyzer at this point shows the operator whether air supply is right for the existing firing rate.

Induced-draft-fan speed is a determining factor on how fast combustion gas flows through a kiln. Control of this fan speed operates through a magnetic coupling whose rheostat may be manually or automatically positioned at the kiln board.

ADDITIONAL BOILER

Since the steam output of waste-heat boilers must vary with cement production regardless of steam demand, an additional chain-grate stoker-fired 65,000-lb-per-hr steam generator keeps steam header pressures stable despite production swings. Its function as a base power source for plant needs insures a flexible power supply even when kilns are down.

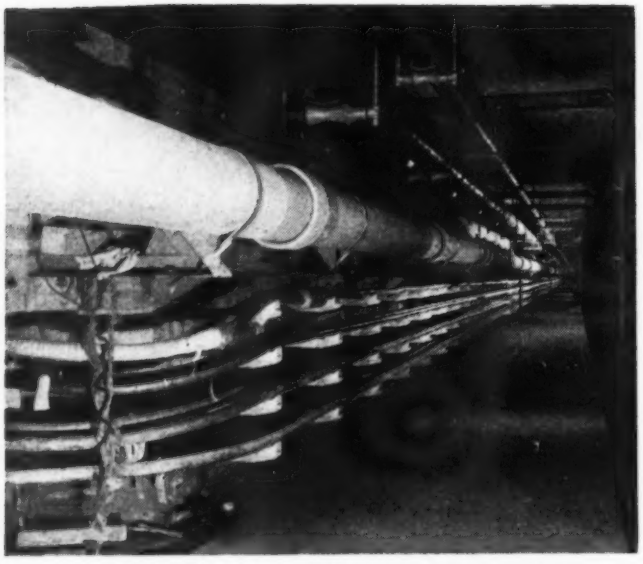
This auxiliary steam boiler fires anthracite culm stored in a bunker above the drum level in the boiler room. Usual operation calls for a 4-inch fire bed with manual control of forced- and induced-draft fans through magnetic couplings. Under heavy load swings there was a tendency to develop a pocket of positive flue-gas pressure near the first of the upper inspection doors. A manometer connects to this former trouble zone to give a constant check on draft variations. This information permits draft corrections that insure a negative pressure at all times.

Steam from both direct-fired and waste-heat boilers supplies (1) a superheated steam header (2) a saturated-steam header. Boilerhouse and turbine room, about 500 ft apart, connect through a service tunnel housing this superheated-steam header as well as condensate returns, electrical cables and control wires and service water for distribution within the turbine room itself. A steam purifier at the end of the superheated steam header removes any condensation formed in the line. This precaution reduces condensation difficulties at the turbines.

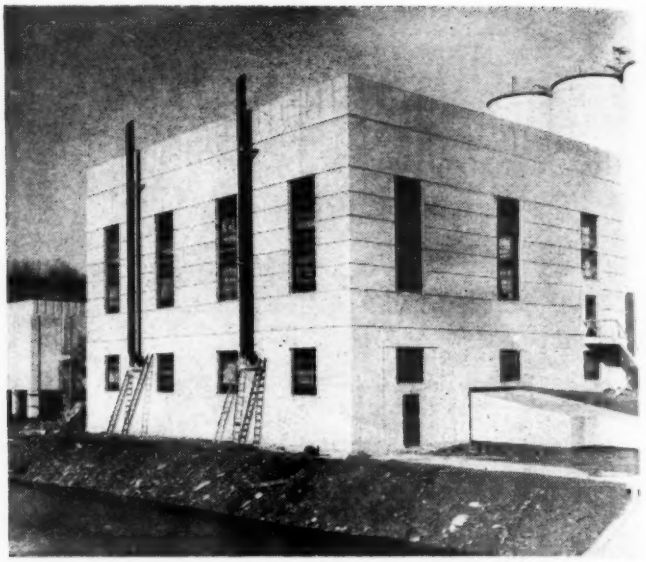
Excess Steam. Provisions exist to handle any excess-steam supply that may develop under heavy kiln operation. In the boiler room some of the waste-heat gas is passed around the economizer directly to the stack. If steam supply is still excessive, and pushes the turbine-main pressure above 252 psi, a bypass ahead of the turbine bleeds up to 18,000 lb per hr to a desuperheating chamber. Condensate sprayed into this chamber desuperheats this excess steam, which then passes directly to the main condenser.

The condensate accumulated in desuperheating was originally discharged to the condenser hotwell. The resultant hotwell temperature rose to the point where "flashing" occurred and formed a vapor lock within the hotwell pump itself. Two methods, one experimental in character, meet this problem.

On one machine, as an experiment, condensate from the desuperheating chamber enters the condenser shell rather than the hotwell as formerly. Operating experience indicates that this increasing of the cooling period for discharged condensate before it enters the hotwell gives no appreciable rise in hotwell temperature. A second and more direct operating aid, that of raising the condensate-



Service tunnel connecting boilerhouse and turbine room carries steam, return lines, service water, various cables



Building housing turbines and condensers shows service tunnel entrance, lower right. Cooling tower appears in rear

pump suction head by raising the well-water level, insures freedom from vapor-lock troubles in the hotwell pump.

CONDENSER WATER

Condenser cooling water comes from the Hokendaqua Creek on whose banks the turbine house is built. At the time of construction the turbine-room floor level was set four feet above the highest known flood level. However, in the first year of its operation this creek flooded to a depth several feet above the turbine floor and shut down the station. Since that time no similar difficulties have arisen.

From a design standpoint, low water posed more problems than floods. Accordingly hollow-shaft deepwell pumps, chosen for suction considerations, supply circulating water to condensers. The impeller elements of these pumps draw at a level well below the creek's lowest water point. Circulating water discharges into a channel which permits reuse by way of a cooling tower under conditions of heavy load or of high creek-water temperatures.

This 6-cell induced-draft cooling tower, inclosed in a concrete exterior, employs a hollow-shaft deepwell pump for its water intake. Discharge from this cooling tower again enters the condenser.

Feedwater control at Northampton consists of biweekly feedwater analyses with a daily addition of compound. Individual boilers receive phosphate and caustic treatment. Sodium sulphite is not apportioned by boilers but enters the water cycle at the deaerator outlet.

PRINCIPAL POWER-PLANT EQUIPMENT

Universal Atlas Cement Co's Northampton, Pa., Plant

GENERATING EQUIPMENT:

Turbine-generators, 2.....Westinghouse Electric Corp
5000 kw: 1, impulse stage, 29 reaction wheels, 3600 rpm, 2300 v, 250 psi, 556-F steam; 1, bleeder stage, external bypass
Turbine exciter, 1.....Westinghouse Electric Corp
125-v dc, 40 kw, 1800 rpm
Condensers, 2.....Allis-Chalmers Mfg Co
5690 sq ft, 2-pass, surface type
Desuperheater chambers, 2.....Allis-Chalmers Mfg Co
250-psi bypass steam, 18,000 lb per hr, to condensate
Air pumps, 2.....Croll-Reynolds Engrg Co
2-stage twin-element steam-jet ejectors
Oil pumps, 2.....Westinghouse Electric Corp
Auxiliary service, turbine drive
Traveling screen, 6 ft wide.....Chain Belt Co
Bleeder valves, 2.....Atwood Morrill Co
4-in. reverse current, oil closing, free flow
Atmospheric relief valves.....Allis-Chalmers Mfg Co
Multiport, adjustable, 6 psi maximum
Steam purifier, 150,000 lb per hr, 150-deg superheat.....Cochrane Corp
Turbine-switchboard instruments.....General Electric Co

BOILERS AND AUXILIARY EQUIPMENT:

Boilers, 3.....Foster Wheeler Corp
Waste heat, 3 drum, 11,420 sq ft heating surface, 28,000 lb per hr, 250 psi, 564-F steam each
Boiler, 1.....Foster Wheeler Corp
Direct fired, chain-grate stoker, 11,420 sq ft heating surface, 3-drum, 65,000 lb per hr, 250 psi, 564-F steam
Superheaters, 4, loop-tube convection type.....Foster Wheeler Corp
Economizers, 3, bare tube, counterflow principle....Foster Wheeler Corp
Stoker, 1, chain grate, 286 sq ft grate surface.....Illinois Stoker Co
Pulverizers, 3.....Raymond Pulv Div, Combustion Engrg Co
Ring-on-roll crusher, 12,600-lb-per-hr coal, 85% fineness
Induced-draft fans, 4.....Green Fuel Economizer Co
1 per boiler, magnetic-coupling control
Forced-draft fan, 1.....Green Fuel Economizer Co
Direct-fired unit only, magnetic-coupling control
Stack.....Alphons Custodis Chimney Constr Co
Brick-lined concrete, 250 ft high, 18 ft diameter
Deaerating heater, 1.....Cochrane Corp
Low vacuum, tray type, 150,000 lb per hr
Evaporator equipment, 1, 2500 lb per hr.....Foster Wheeler Corp

PUMPS AND WATER HANDLING:

Circulating-water pumps, 2.....Pomona Pump Co
8500 gpm, hollow shaft, deepwell
Cooling-tower pumps, 3, hollow shaft, deepwell.....Pomona Pump Co
Two: 4000 gpm; one 4000 to 2000 gpm
Service-water pumps.....De Laval Steam Turbine Co
One: 500 gpm, 250-psi steam turbine drive
Three: 2000, 1000 and 500 gpm respectively
Condensate pumps, 2150 gpm, motor driven.... Allis-Chalmers Mfg Co
Boiler feed pumps, 4.....Worthington Pump & Mfg Co
One: 200 gpm, 3600 rpm, 250-psi steam turbine drives 1: 300 gpm; 2: 150 gpm, motor driven
Cooling tower, 1, 6-cell induced-draft propeller fan....C H Wheeler Co

THE OPERATING ENGINEER

George Edwards *Advisory Editor*

PRACTICAL AIDS • MAINTENANCE HINTS • QUESTIONS — ANSWERS

PUBLISHED MONTHLY AS AN INTEGRAL PART OF POWER

Telltale Signs Alert Refrigerating Men

High head pressure may indicate poor condenser performance or air trapped in a system. It's just one instance of troubles diagnosed by watching pressure gages, says George Holman

▶ IN THE OPERATION and maintenance of a refrigeration system coming events cast their shadows before them. A compressor bearing doesn't burn out, a cylinder become scored or an automatic-expansion device fail to function without a warning which, at least in its advanced stages, can be detected by an alert operator or mechanic. Sometimes an effect may result from a number of causes; or a cause may produce a number of effects. But 99% of all effects have noticeable preceding causes.

Here are five classifications of trouble that a *discharge-pressure gage* indicates:

1. If condenser pressure is too high, these are the causes and (in italics) their correction:

A: Not enough condensing water. *Use more water.*

B: Condensing water is too warm. *Cool it by atmospheric evaporation.*

2. During the off cycle as well as during operation, the gage indicates a temperature (red figures) higher than that shown by a thermometer placed in a well in the liquid line from the condenser, or in the water leaving the condenser. Cause is air or other noncondensable gas in the condenser. *To correct, purge.*

3. After purging, noncondensable gas again accumulates in the condenser. Causes and corrections are:

A: Air is admitted when system is opened. *After inspection or repairs, pump the system down to a high vacuum and discharge the air to atmosphere. After a number of hours, purge the condenser.*

B: Air leaks into the system under vacuum, as when pumping down evaporators before shutting down the compressor. *Inspect for leaks at points where air might enter, yet where the refrigerant does not escape when pressure is reversed, as at valve stems, piston rods and crankcase packing.*

C: Breakdown of lubricating oil into carbon and hydrocarbon gas. *Use proper oil with high flashpoint consistent with congealing temperature. Maintain low-discharge temperature with low-compression ratio, low-condenser pressure, and by keeping the vapor wet or saturated as it enters the compressor.*

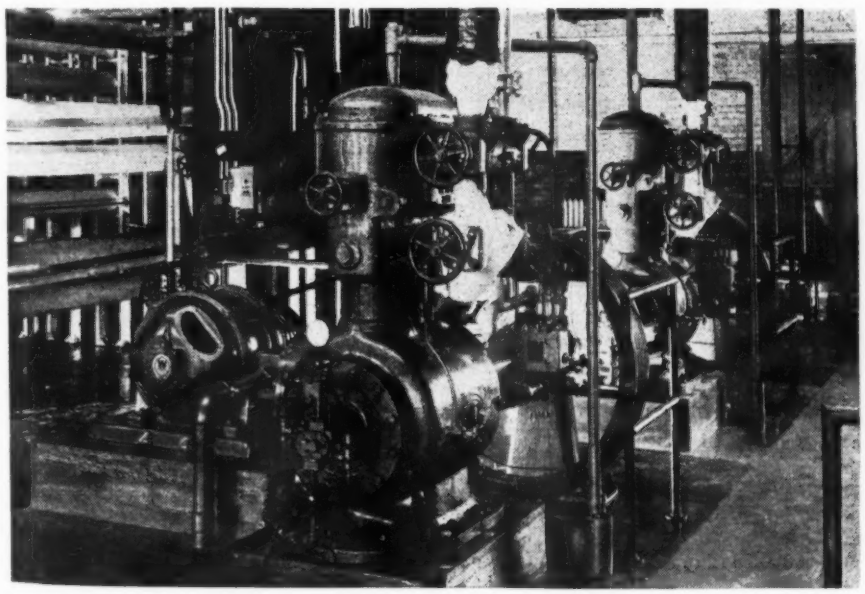


Fig. 1—If condensing pressure fails to rise when starting, compressor safety valve, inlet and discharge valves, piston rings or bypass valve may be leaking

CONDENSER FAULTS

4. Temperature indicated by discharge gage corresponds to that indicated by a thermometer in the liquid line or in the condenser discharge water during the off cycle, but denotes a much higher saturation temperature when compressor is operating. Causes and corrections are:

A: Water is unevenly distributed over condenser surface. *(a) Clean water spray holes of distributing pipes or atmospheric condenser. (b) Adjust water distributing ring and guides of vertical shell-and-tube condenser. (c) Inspect and replace leaking cover-plate gaskets of horizontal shell-and-tube condenser.*

B: Condenser heat-transfer surface is coated with scale, slime or grease. *Clean.*

C: Accumulation of liquid refrigerant

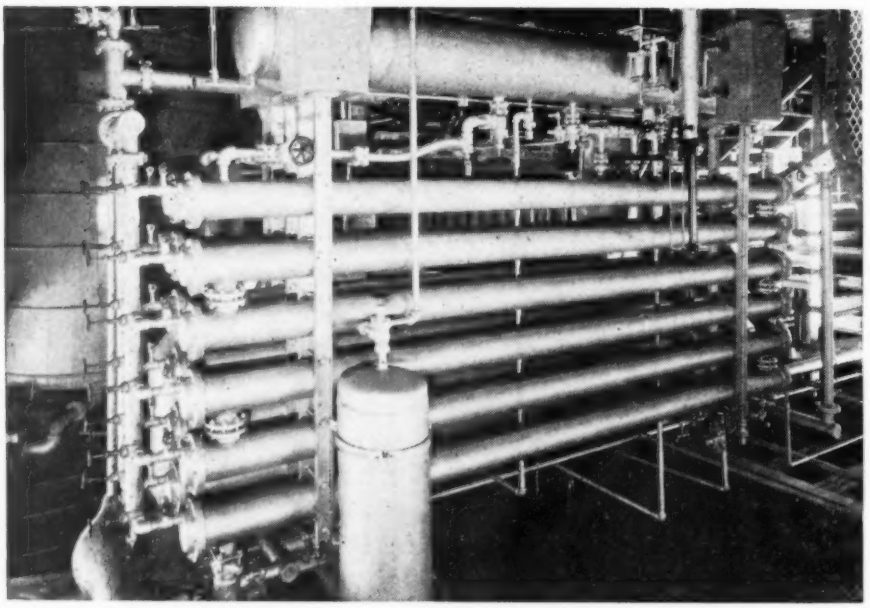


Fig. 2—Oil sludge, together with such elements as scale, rust and litharge from pipe joints may cover condenser tubes and seriously interfere with heat transfer

trapped in the condenser. *See that liquid line leading from the condenser is unobstructed.*

D: System is overcharged with refrigerant. *Draw off the excess.*

E: Part of condenser or receiver is filled with oil carried over from the compressor: *Blow down the oil.*

F: Inner heat-transfer surface of condenser is covered with sludge, and the refrigerant, together with scale, rust and litharge. *After pumping out the condenser, open it; clean the inner surface with kerosene, carbon tetrachloride or other oil-sludge solvent.*

5. Condenser pressure fails to rise when compressor starts. Such rise is sometimes necessary to prevent vapor binding in a highly placed thermal-expansion valve or high-pressure-float regulator. Causes and corrections are:

A: Cold or too much condensing water. *Throttle the water flow.*

B: Compressor is not working because (a) suction valves stick closed (b) discharge valves stick open (c) safety-valve seat does not hold (d) safety-head seats leak (e) blowby past piston rings (f) bypass or pumpout valves on the compressor manifold are open or leaking badly (g) serious leak or loss of refrigerant or (h) a combination of these factors. *Inspect the compressor and repair all possible places where vapor of the refrigerant can feed back into the evaporative system from the condenser.*

A suction-pressure gage indicates various troubles, which are described in the following ten classifications:

1. During the off cycle without pumpdown, suction pressure rises until pointer reaches and steadily indicates a temperature near that of the brine or cooling rooms. Cause is liquid left in the evaporator at shutdown, which evaporates until it builds up a pressure corresponding to the saturated temperature. *No correction, unless high-suction pressure overloads motor or engine when the compressor is started. If so pump the system down when stopping the compressor, or close the suction valve when starting.*

2. During off cycle without pumpdown, suction pressure rises until the pointer indicates a temperature much higher than that of the brine or cooling rooms. Causes and corrections are:

A: Expansion valve leaks. *Reseat the valve.*

B: Compressor valves or safety heads leak. *Reseat the valves and safety heads. If necessary, rebore cylinders and replace pistons and rings.*

C: Compressor manifold valves leak. *Renew the seats.*

D: Safety valve leaks and is set to discharge into evaporating system. *Test and repair.*

3. Suction pressure is high during continuous compressor operation. Causes and corrections are:

A: Warm brine, air or other medium surrounding an evaporator that is fed by an automatic expansion device set for full evaporator capacity. *No correction that is consistent with capacity operation. Cover and insulate brine tank. Keep storage-room doors closed. Ascertain reason for excess load.*

B: Hand expansion valve is opened too wide or leaks. *Adjust expansion valve for capacity operation, or repair.*

C: Loss of compressor capacity. *Inspect compressors; repair and reseat valves, piston rings, safety heads and manifold valves.*

D: Manifold strainer clogged. *Remove and clean.*

E: Leakage past seat of safety valve, which is connected to discharge condenser vapor into low-pressure side of the system. *Test and reset.*

SUCTION PRESSURE TOO LOW

4. Suction pressure is low during continuous compressor operation. Causes and corrections are:

A: Cold medium surrounds the evaporator. *Low suction pressure is natural under such conditions.*

B: Expansion valve is closed too far. *Open valve wider.*

C: Brine or air circulation around the evaporator is sluggish. *Ascertain and remove cause of obstructed circulation.*

D: Brine pump, agitator or fan stops. *Throttle manifold suction valve, then start pump or fan.*

E: Direct expansion evaporator is heavily frosted. *Defrost.*

F: Carryover oil accumulates in evaporator and detracts from its volume and capacity. *Blow down oil; open and clean evaporator.*

G: Low condenser pressure, with loss of expansion-valve capacity. *Raise the pressure by throttling condensing water.*

H: Expansion valve orifice or distributing nozzle is plugged. *Clean thoroughly.*

I: Strainer in liquid line, return line or expansion valve is plugged. *Remove scale; clean oil traps and strainers.*

J: Power assembly of thermal-expansion valve has lost its charge. *Install new unit.*

K: Capillary tubing of thermal-expansion valve kinked and pressure of power fluid in feeler bulb is unable to reach diaphragm. *Replace power assembly; straighten tube with caution.*

L: In some thermal-expansion valves push pins are too short. *Use longer pins.*

M: Some thermal-expansion valves have two gaskets under diaphragm bonnet. Diaphragm does not reach ends of push pins at existing fluid pressure, and gives the same effect as pins that are too short or wrong fluid charge. *Make sure that only one good gasket is under the diaphragm bonnet.*

N: Warm liquid refrigerant expands into vapor with pressure drop in the liquid line, caused by evaporator being higher than condenser or receiver. Result is vapor binding of thermal-expansion valve. *Subcool the liquid refrigerant*

by passing it through a coil of pipe submerged in cold water or brine, or by installing a heat exchanger (accumulator).

O: (a) Vapor binding of high-pressure-float regulator caused by its height above condenser or receiver. (b) Gas binding of high-pressure-float regulator by noncondensable gas during the off cycle. *(a) Subcool the liquid refrigerant with water, brine or cold vapor returning from the evaporator. (b) Keep system thoroughly purged.*

P: One or more stop valves between the condenser, or receiver, and the evaporator; or between the evaporator and the suction gage, partly closed. *Adjust regulating valves and open the stop valves to back-seat.*

5. Suction pressure falls rapidly when compressor starts, and remains low. Causes and corrections are:

A: System is pumped down before stopping compressor. *Usually needs no correction; use shorter pumpdown period.*

B: Failure to start brine pump or fan when starting compressor. *Have brine pump or fan running before starting compressor.*

C: Evaporator contains sludge or carryover oil. *Blow down oil and clean the evaporator.*

D: Medium surrounding evaporator is very cold. *No correction.*

E: Evaporator is heavily frosted. *Defrost.*

6. Suction pressure falls rapidly on starting the compressor, then rises to normal. Cause: No liquid is left in evaporator from preceding operating cycle. *Use shorter pumpdown period.*

7. Suction pressure falls slowly when compressor is started. Causes and corrections are:

A: Evaporator contains considerable residual liquid from preceding operating cycle. *Institute longer pumpdown period before stopping the compressor.*

B: Expansion valve leaks during the off cycle. *Repair the valve.*

C: Vapor from condenser leaks back through the compressor, safety valve or manifold valves into the evaporator during the off cycle. *Inspect and repair compressor valves, safety heads, rings and manifold valves.*

D: Strainer at suction manifold is plugged. *Clean strainer.*

COMPRESSOR LEAKS

8. Rise of suction-gage pointer is rapid when main return valve is closed during off cycle of the compressor. Cause: Refrigerant vapor leaks back through compressor valves, safety heads, manifold or safety valves. *Repair faulty valves.*

9. Suction pressure begins to drop suddenly during operation. Causes and corrections are:

A: Brine pump, agitator, or fan on direct-expansion, forced-circulation evaporator has stopped. *If liquid is fed to evaporator by an automatic, nonflooding expansion device, inspect and start pump, agitator or fan. If expansion control is manual, or if liquid refrigerant has accumulated in evaporator, throttle suction valve at manifold to less than a full turn open before starting pump or fan.*

B: Automatic expansion valve is plugged with sludge, scale or ice. *Clean.*

10. *Cycling*, or slow and persistent rise and fall of suction pressure, occurs. Causes and corrections are:

A: Needle of thermal-expansion valve sticks in its orifice when it has been ground, worn or eroded to a wedge taper. *Polish needle and seat to nonwedging surface and shape.*

B: Push-pin packing is too tight. This prevents sensitive valve reaction to spring- or diaphragm-pressure variations especially if pins are worn, or there is a wedging effect of the needle to exaggerate it. *Polish and repack pins. Oil new packing.*

C: Diaphragm of power assembly is warped. *Replace with new unit.*

D: Power assembly of thermal-expansion valve is wrongly charged for existing room temperature. *Check with manufacturer. Install new valve, or replace power assembly with one having proper fluid charge.*

E: Feeler bulb in intermittent draft of warm or cold air. *Protect bulb from changing air currents.*

F: Capillary tubing of thermal-expansion valve is badly kinked. *Replace the assembly.*

G: Capillary tube contacts cold pipe, cold frames, or goods, thereby causing a false pressure at the diaphragm of a thermal-expansion valve. *Keep capillary tubing entirely in air.*

H: Feeler bulb of thermal-expansion valve makes poor contact with evaporator pipe. *Clamp bulb firmly.*

I: Feeler bulb is installed too near the evaporator inlet. *Move bulb.*

J: Volatile-liquid-charged feeler bulb is clamped on pipe with capillary-tube connection on the bottom. *Turn bulb to put connection on top.*

K: Feeler bulb is affected by wet vapor from other evaporators. *Move bulb to better location; regulate valves on other evaporators.*

L: Needle of float regulator wedges in seat. *Polish needle and seat to nonwedging surface and shape.*

M: There is lost motion from wear of float-regulator pins and arms. *Retrim with caution; return regulator to manufacturer for new trim and proper adjustment.*

N: Intermittent vapor or air binding of float regulator. *Inspect regulator for proper operation. Keep condenser well purged for satisfactory operation of high-pressure float regulator.*

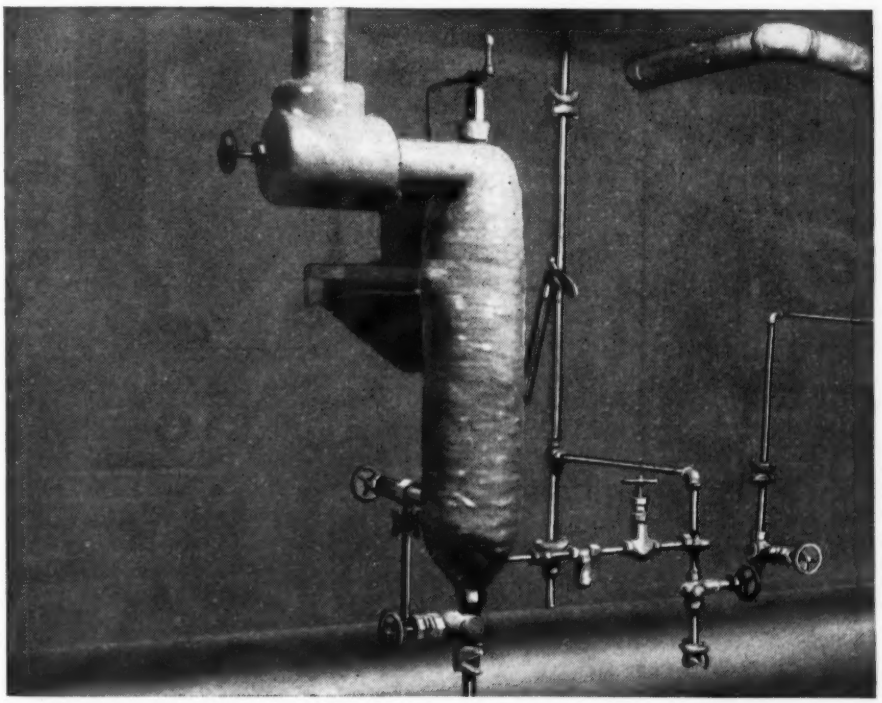


Fig. 3—After inspection and repairs, pump the system down to a high vacuum to remove air. Use an automatic purger to keep system free of noncondensable gas

PRACTICAL AIDS TO OPERATION

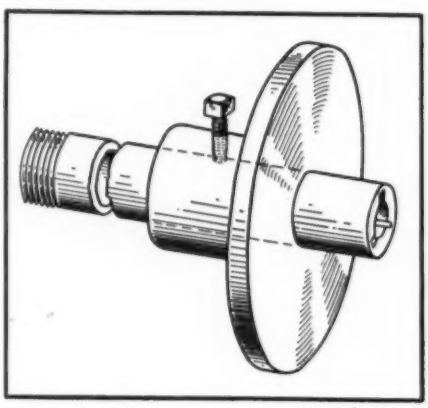
Plant-Tested Methods and Ideas for Power Men

Photo, courtesy, Compressed Air Institute

COMPRESSED AIR CLEANS BOILER TUBES

COMPRESSED-AIR SOOT-BLOWING systems for cleaning boiler tubes have come into general use, particularly in watertube boilers. The photo shows a compressed-air cleaner, built in one plant for cleaning the inside of the tubes in firetube boilers. It consists of a shovel handle attached to a pipe length that reaches through the tubes. A metal disk at the end of the pipe in the drawing, dislodges the soot from the tubes as it is pushed through them and is blown out to the back of the boiler by the compressed-air stream from the pipe.

A flexible metal hose connected ahead of the shovel handle admits compressed air to tube-cleaning pipe *A*. Valve *V*, connected to an operating lever *L* at the shovel handle's free end, gives the fireman control of air flow to the tubes. After soot is dislodged from the tubes by the disk on the pipe the fireman opens air valve *V* by pressing on lever *L* with his thumb to blow the soot out. Bars *B* across the end of the boiler's shell assist the fireman to guide the cleaner from one tube to another, and at the same time save his brawn and his equanimity.



Ground Glass Cuts Elevator-Sheave Grooves

OVERHEAD SHEAVES of an elevator were badly worn and needed regrooving. An imprint of the wires and strands of the cables were worn in the sheave grooves. This condition was so unusual that a careful search was made for the cause. The elevator was not a busy one and its sheaves should not have worn the way they did under normal conditions above the average elevator.

An adjacent novelty plant used ground glass in some of its decoration on post cards. Some of this glass had filtered through a small opening and adhered to the steel cables. They did not appear to be injured, but with the glass as an abrasive they cut their imprint into the sheaves' grooves.

The Maintenance Co M A MYERS
New York, N. Y. Electrical Engineer

Care in Operation of Cast-Iron Steam Boilers

CARE AND FREQUENCY of attention determine to a large extent the dependability of cast-iron boilers. Give careful attention to proper installation of appliances and to care of the boiler while out of service.

1. Cracked sections, which usually result from overheating or overstressing, are expensive. Overheating may result from low water, internal accumulation of sediment, operating boiler at excessive capacity. Overstressing usually results from restricted expansion.

2. To avoid low water, vigilance of the attendant is a prime requisite. This may well be supplemented by a full complement of automatic controls. Regardless of such controls, do not leave the boiler unattended for long periods. Check water level at least each morning and night if fully protected by water-level controls; more frequently if possible. If water level is not automatically controlled, several additional daily visits to the boiler are recommended. Blow out the water column and gage cocks, and check the latter frequently to insure true water-level indication. Blow sediment out of

boiler and test automatic controls frequently.

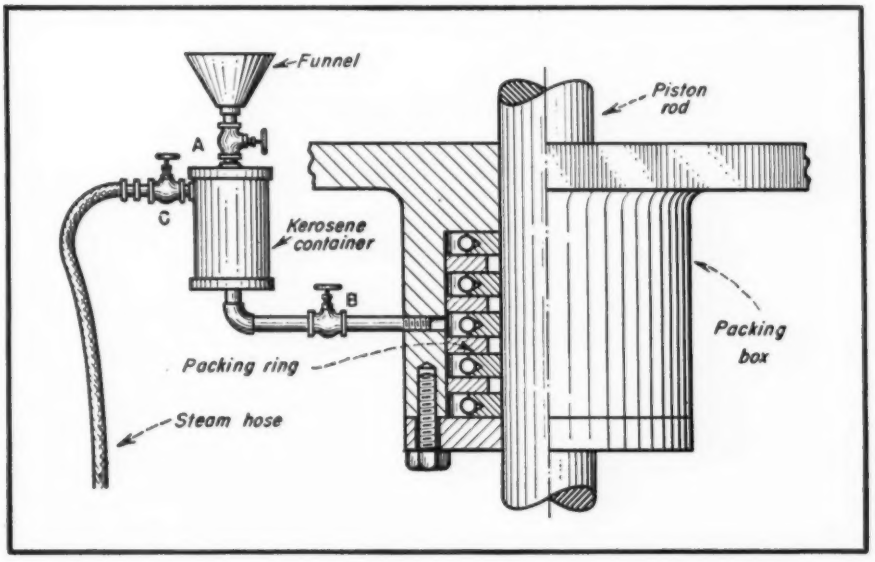
3. To avoid sediment accumulations, open blowdown valves for a few moments at least weekly. Make sure they are closed tightly and that water level is normal before leaving the boiler. Drain the boiler yearly and flush through any available pipe connections.

4. Avoid forcing and overstressing. Boiler should be of adequate size. Allow time for starting as a hot fire may damage a cold boiler. Do not burn refuse at a rate that causes flame to pass into the upper gas passes. Use expansion washers under through-rod nuts to avoid localized stresses. Do not check a hot fire by leaving the firing door open; close the ashpit door and use the dampers. In emergencies, smother a coal fire with ashes or coal to avoid overheating the boiler.

Canton, Mass. HARRY M SPRING

Flushes Metallic Packing With Kerosene

METALLIC PACKING on a large marine reciprocating steam engine would start blowing during long runs because cylinder oil, swabbed on the piston rods, gummed up the packing rings. They fitted into grooves and were held together by garter springs. Normal practice was to wait until the ship got into port when the glands were removed and the packing and springs washed with kerosene.



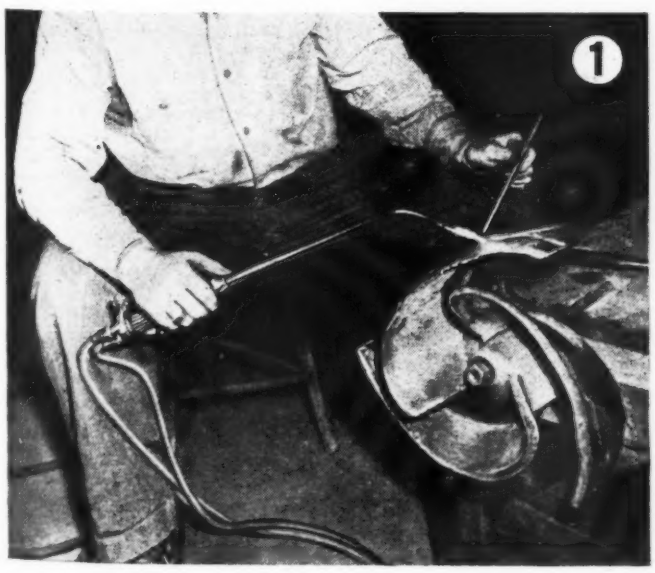
On one ship the packing did more than the usual amount of blowing so we decided to stop it. We made a container from a 4-in. pipe nipple, 6-in. long with a cap on each end. We disconnected the small vacuum line used to draw condensate from the stuffing box and in its place connected the container, as in the diagram. A connection was made into the container's bottom for flushing through a valve and in its side for a steam line through a valve as shown.

To fill the container, valves *B* and *C* are closed, *A* is opened, and one quart of kerosene poured in through funnel. Then. valve *A* is closed and *B* opened after which *C* is cracked to admit steam slowly to the container. As pressure builds up in the container the kerosene and steam are forced in around the packing rings to free them of gummy cylinder oil. By flushing the packing rings at regular intervals we kept the blowby under control. After the flushing is completed the container is removed and the vacuum connection is remade.

Flushing, N. Y. S M ELONKA

BRONZE SURFACING RECLAIMS PUMP IMPELLERS

WHEN HANDLING WOOD PULP the cast-iron impeller blades of a pump wear away at their outer ends. They can be restored to their normal shape by bronze welding, Fig. 1. Before welding clean all grease, dirt and rust from the blades with a stiff wire brush. Apply flux liberally to the areas to be rebuilt so they will be clean chemically as well as mechanically. Use a slightly oxidizing flame for depositing the bronze welding rod. Careful tinning of the area to be re-



stored assures a good welding bond.

As a guide when depositing the rod, the welder used a sheet-metal template, made in the shape of the blade. When rebuilding each blade the operator paused occasionally and tested its shape with the template. Thus he was able to deposit the metal correctly and reduce to a minimum the work necessary to finish the blades' surface.

A template of this kind, somewhat similar to a "go and no-go gage," can be used to advantage in many welding applications. It saves welding rod, gases and time by helping the operator avoid depositing too much metal. In this way less grinding or machining is needed to finish the job.

New York, N. Y. H H GRIFFITH
The Linde Air Products Co

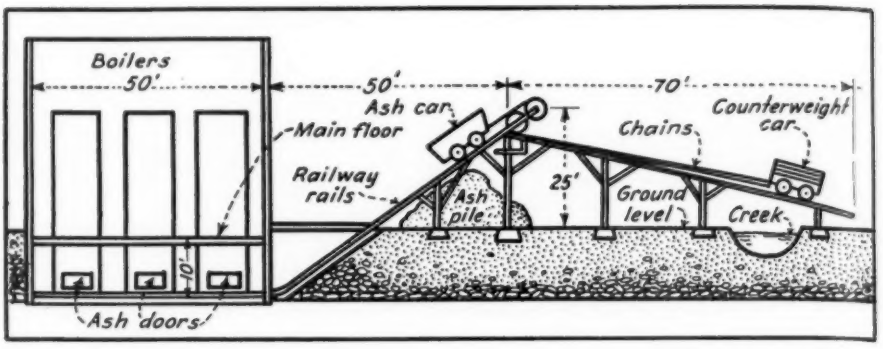
Timesaver For Close Crane Work

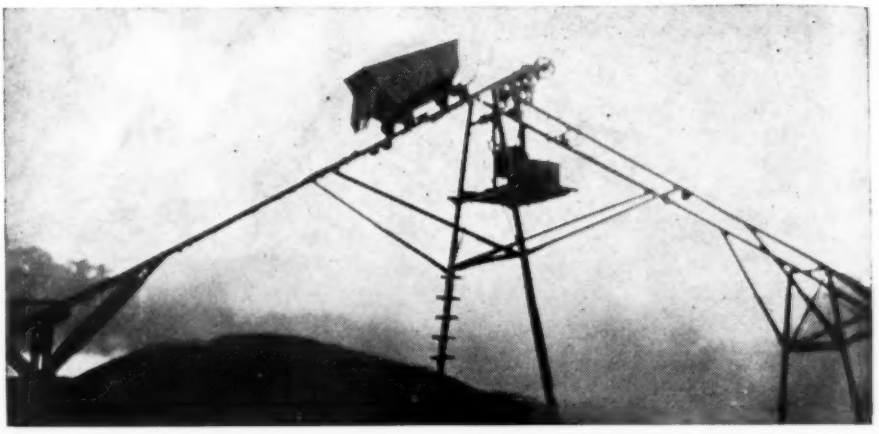
DURING THE ERECTION of large vertical-shaft alternators, the job of assembling the polepieces on the rotor developed into quite a problem with the cranes available. To assemble the rotor its shaft was set on end on its 3-ft flange coupling, rotor halves assembled on it and bolted together in their proper place. Next the polepieces were bolted on with capscrews in clearance holes through the rotor's rim and threaded in holes in the polepieces. The 150-ton traveling crane's main hook was too slow to handle the 1300-lb polepieces satisfactorily and its auxiliary hook was too fast for the accurate spotting required. The crane operator would spot the polepieces too low or too high, so a lot of time and patience were needed to get the cap screws started in the threaded holes. Consequently, a poor time record was made in assembling the first unit.

To assemble the polepieces on the rotor of the second unit we hung a one-ton chain hoist on the crane's auxiliary hook and picked up the load with it in the hoisting system. Then the crane man spotted the polepiece as closely as he could, and the hook man completed the job with the chain hoist so that the assembler could start the capscrews in the holes. The job was finished in about 25% of the time taken for the first unit and was used on the other fifteen installed. This arrangement will be a great timesaver in many places where accurate placing of fairly heavy weights is necessary.

Before I saw this experiment, I was on a job helping to set several hundred 500-lb castings on steel forms against which large hydraulic-turbine gates closed. Our hoisting engineer was on the building top out of sight and hearing. Much of the work was 40 ft above the rocks below, and these pieces had to line up to match threaded holes. We nearly got knocked off the forms several times by the castings when trying to have the engineer place them correctly. The trick described would have been worth the weight of the chain hoist in gold when placing the castings, but the idea had not yet penetrated our young heads.

Cincinnati, O. H B MCDERMID





JUNK PRODUCES ASH-DISPOSAL SYSTEM

THE DRAWING AND PHOTOGRAPH show the ash-disposal system that Henry Leopold, superintendent, of Extract Co in Tennessee, built for his boiler plant. The whole structure, which is electrically welded, is made from salvage material found around the plant. Old railroad rails serve as tracks for the ash car, and old boiler tubes make the structure's columns, struts and braces. No bolts were used except those in shaft bearings and for holding down the reduction gear and 5-hp driving motor.

The system is automatic. When the car is pulled to a point near the tower's top the car's tail-gate latch is tripped and the ashes flow out onto the pile. An automatic switch then reverses the motor returning the car to the boiler basement for another load. A manually operated switch at each end of travel permits stopping the car at any point along the tracks.

Two ½-in. closed-link chains run from the car around sheaves in the tower's top, then around sheaves on the drive shaft and down to the counter-weight car to which they connect. As the ash car ascends, the counterweight car descends, and vice versa. The car holds 1.5 cu yd of ashes and is doing a good ash-disposal job in a plant that burns 130 tons of coal each day.

Troy, Ohio R G SWISHER
Hobart Brothers Co.

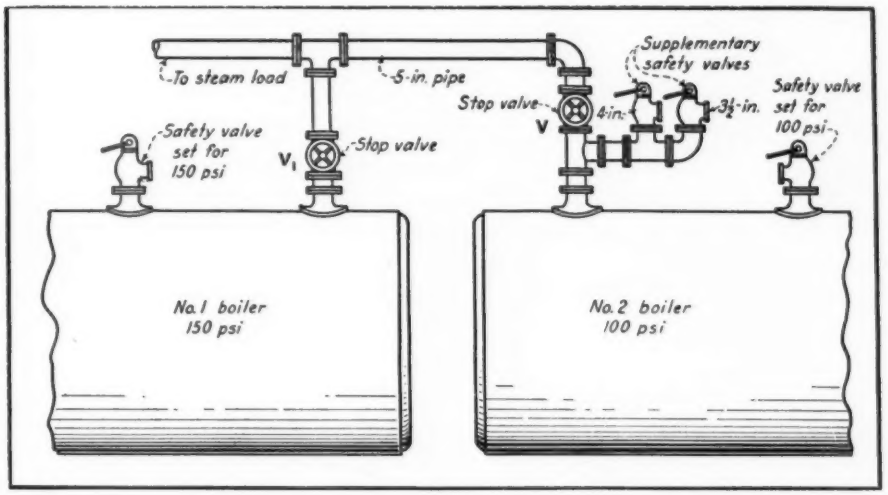
Protecting Two Boilers With Different Pressures

A QUESTION FREQUENTLY ASKED in state and municipal examinations for engineers and firemen is: What safety valves are required on two boilers that are allowed different pressures but connected to the same header as in the diagram? Boiler No. 1, good for 150 psi and with its safety valve set for that pressure, connects to boiler No. 2, permitted to operate at pressure of not over 100

psi for which its safety valve is set.

The two boilers connect to a common header through stop valves to avoid the expense of installing a second piping system, as is done in some small plants. During working hours stop valve V is closed and V_1 opened for the 150-psi boiler to supply the manufacturing and heating load. When the manufacturing plant is shut down stop valve V_1 is closed and V opened to permit the 100-psi boiler to take the heating load.

The 100-psi boiler must be protected against the higher pressure in case stop valve V were opened accidentally while the 150-psi boiler is in service. Under this condition steam might flow from No. 1 boiler into No. 2 at a rate, combined with the latter's evaporation, that would exceed the 100-psi safety valves' capacity. However, this valve needs only sufficient capacity to take care of the lower-pressure boiler's evaporation. For this reason most boiler laws require a supplementary safety valve or valves with an aggregate area of not less than that of the pipe connecting the two boilers together in a bank.



For example, assume a 5-in. connecting pipe between the boilers, as in the diagram. This pipe has 19.7 sq in. cross-sectional area. Supplementary safety valves must therefore have an area at least equal to 19.7 sq in. In this case a 4-in. and a 3½-in. safety-valve combination having 22.6 sq in. total area will meet the requirements. Set these valves for no greater pressure than that allowed the boiler they protect.

Canton, Mass. HARRY M SPRING

TESTS HEAT-EXCHANGE COILS WITH AIR PRESSURE

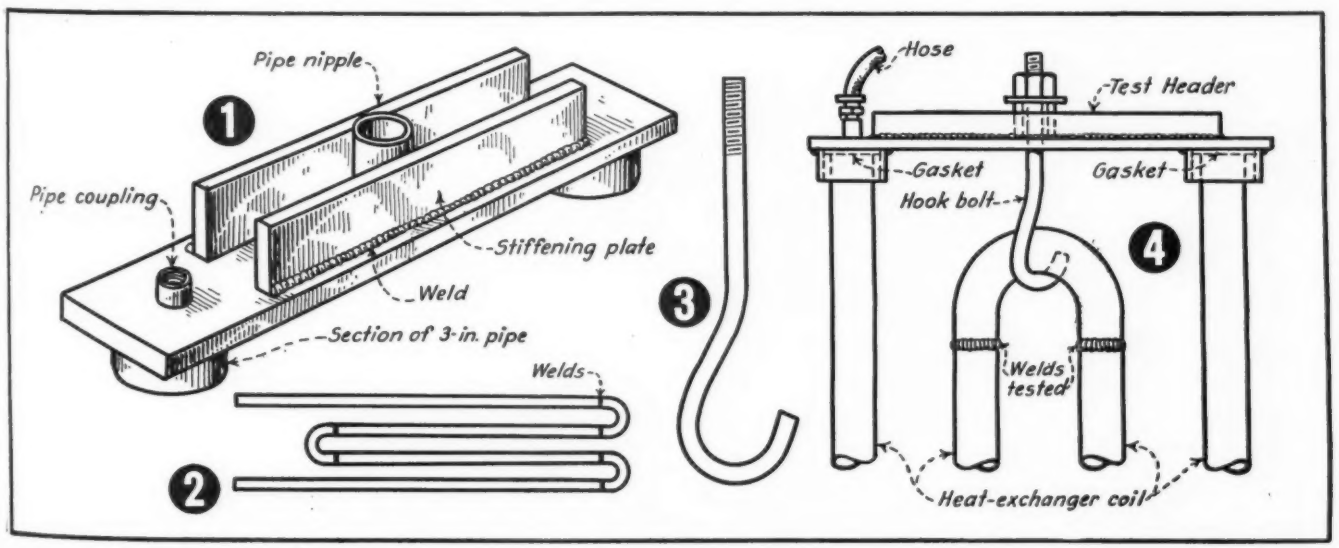
WE BUILT A HEAT EXCHANGER of coils made of straight pipe and welding return bends, Fig. 2. When the coils were assembled in the heat exchanger some of the welds would not be accessible for repair if they developed a leak. We therefore pressure-tested the coils before assembling them in their headers.

Because this was an all-welded job there were no threaded ends on the coils to make pressure connections for testing the coils with air-and-soap solution. This problem was solved by making a header with a blind connection for one end of the coil and an air connection on the other. This header consisted of a piece of ⅝-in. steel plate, 3½ in. wide, and long enough to span the coils free ends.

We drilled a ¾-in. hole at the plate's middle and welded around it a 1-in. pipe nipple, 3 in. long. To strengthen the plate we welded to it two stiffening plates, 3 in. wide, as in Fig. 1. At each end of the plate on its underside we welded a short section of 3-in. pipe. These sections were spaced the same distance apart at the ends of the heat-exchanger coils. At one end of the plate in the center of the 3-in. pipe section we bored a ½-in. hole and welded a pipe coupling around it to provide an air hose connection. Fig. 1 shows the test header assembly. A ¾-in. hook with nut and washer, Fig. 3, completed the test equipment.

In Fig. 4 one of the heat-exchanger coils is connected to the header for testing. Ends of the heater coils seat in the header against flat gaskets to compensate for the roughness of coil ends. When testing with air and a soap-and-water solution, use about 20-psi air pressure because a higher pressure blows the bubbles away from a leak as fast as they form.

Bellingham, Wash. DEAN H BERGMAN



READER'S PROBLEMS

Exercise your engineering wits by submitting answers to these questions fresh from the plant. Suitable material will be paid for; answers accompanied by sketches or photographs command additional pay

1—How Can Waste Heat Be Reclaimed?

IN OUR LAUNDRY, waste water from the washers at about 120 F discharges directly to the sewer. I believe we could heat incoming water 10 or 20 F by extracting heat from this waste water if we had a suitable heat exchanger. Because incoming water flow is intermittent in relation to waste discharge I would like to know what kind of heat exchanger will produce the best results.

I have been considering building a concrete pit with overflow to the sewer to hold the waste water. Installed in the pit will be several layers of pipe connected into grids through which the fresh water will flow. What is the best way to design and connect the related parts? Will this arrangement work as well or better than a shell-and-tube heater? How can the waste-water piping be arranged to prevent cold-rinse water from the washer being dumped into the heat reclaimer pit?—*MRM*

2—Which Voltage Is Best for Our Purpose?

OUR WOODWORKING PLANT is driven by line shafts and belts at present. We can get immediate delivery on two 200-kva ac generators, one 440 v and the other 2300 v. I would like to know which voltage we should select to furnish power for individual electric drive to replace the line shafts. We expect to drive the machine with our present 270-hp steam engine.

We now use a 36-kva 440-v diesel-engine-driven ac generator to furnish lights and power for the machine-shop 440-v motors, totaling 11 hp. Load on the main generator would be about 150 kw made up of two 75-hp planers; two resaws, one 50 hp and the other 75; two fans, one 50 hp and the other 25; a 15-hp trimmer, and two conveyors requiring 7 hp.

Motorizing this equipment will do away with the shafting and considerable belting and should result in an appreciable saving in power.—*DW*

Answers to April Questions

Can I Reclose Field Switch on This Generator?

(This is Question 1 from the April issue, with best answers from readers.)

In our power plant we have three ac generators. Two are 1500-kw 80%-pf 2300-v 60-cps 3600-rpm turbine-driven machines. The third is a 750-kw 70%-pf 440-v 60-cps 300-rpm unit, direct-connected to a 2-cylinder double-acting steam engine. The switchboard for the engine-driven generator is an old-style open-front board. On two occasions the field switch to this generator was opened while the generator was operating under load. Each time we shut the machine down and restarted it just as we do when bringing it on the line. This interruption forces us to drop load and is disrupting, to say the least.

What would happen if the operator were to reclose the field switch as fast as possible? Would it be the same as closing the line switch when the generator is out of synchronism? Would serious voltage surges result or would the generator jump out of step while operating as an induction generator? I would like to know whether POWER *readers have seen or tried this stunt, and if so what happened to the generator?—RSM*

Paint Switch Handles

RSM SHOULD BECOME a little more safety conscious. Opening the dc field switch of a loaded ac generator is like letting a boy play with a loaded shell. You can get away with it 99 times but the hundredth time disaster will result.

My suggestion is to preach safety to the operators, telling them never to open the field. Frankly, they can open the switch without danger, but it sets a bad precedent and becomes a regrettable habit. Every precaution should be taken not to pull the field switches even accidentally. I suggest painting the switch handles white, or black and white in stripes, to make them stand out.

What is the danger of opening an ac generator field switch? If the switch is not equipped with discharge-resistance clips (which *RSM* does not mention) opening it causes an arc that could spatter copper on the operator and severely burn him. Because of the inductance of the field an induced voltage is established that is sufficient to break down the wiring or field to ground.

When field excitation is removed from a high-speed few-pole ac generator the rotor slips one or more poles and causes instability on the system. This reflects on the other units and may result in a complete out-of-step condition.

On the other hand the rotor of a slow-speed many-pole ac generator may have a high flywheel effect. Therefore, when the dc field is opened the large rotor with its high inertia has less tendency to slip the pole. If the field switch is closed immediately and field excitation strengthened the machine will pull in step again.

However, may I repeat, although it can be done on this machine, do not establish the practice. An ounce of prevention is worth a pound of cure.

Tenafly, N. J. K B HOFFMAN

Prime Mover Speeds Up On Loss of Field

THE ANSWER to *RSM's* question involves several factors. When the field switch is opened, excitation is removed from the generator and it delivers less power to the system than previously. This in turn enables the prime mover to speed up, and pull the generator out of synchronism until the prime-mover governor can adjust input to the new conditions.

The two factors that determine whether the field switch can be reclosed without large current surges are (1) the length

of time the switch is open and (2) the rate of prime-mover acceleration. If the switch is only partially opened—still drawing an arc—the chances are that immediate reclosure could be accomplished before the generator's prime mover has pulled it out of synchronism. However, if the time, measured by cycles is long, the generator is out of synchronism.

If the latter is true, reclosing the switch will be exactly the same as trying to synchronize an out-of-synchronism generator, and surges will result. If the generator is above synchronous speed and operating as an induction machine, closing the field will draw the machine into synchronism but this action will be attended by current surges as the excited poles on the generator rotor sweep past the armature poles.

General Electric Co CEK

Reduce Engine Speed And Close Field

ORDINARILY THE ANSWER TO RSM's question is to change the switch-handle design, as in photograph 1-*A*, and fit it with a latch or install a special pull-and-turn shaft to prevent accidental opening of a generator field switch. This suggestion applies when numerous identical control switches are mounted on the same panel. But RSM states specifically that the engine-driven unit has an old-style switchboard, supposedly isolated from the other units. This raises the question of carelessness on the operator's part because the field switch on these boards is so different from other ones found on the same panel that there is little excuse for so-called accidental opening.

Once the switch is open there is no reason why it cannot be closed without disconnecting the generator from the line.

Naturally doing so causes voltage surges on the system but this also occurs when the switch is opened. Immediately upon loss of dc excitation a heavy inrush of current flows from the bus into the generator. This may or may not trip the generator ocb by overload; generally the current is within the relay setting and the machine then operates as an induction generator. Result is that the unit speeds up because it is no longer locked in step with the system but, running as an induction generator, it carries a good part of its former load.

Situation now is that the generator carries partial load but draws a heavy exciting current from the system. Naturally prolonged operation under this condition will perhaps overheat the generator or burn out the field discharge resistance. But if no serious damage occurs on the initial disturbance there is no reason to become unduly alarmed and open the generator main switch. Doing so separates the generator from the system but the heavy current interruption may seriously burn the ocb contacts and the quick drop in exciting current, furnished by the remaining generators, may cause voltage surges on the system until the voltage regulators can restore stability.

Best solution is to slow down the generator prime mover by either adjusting the governor or almost closing the throttle valve. Steam supply can be shut off entirely letting the generator run as a motor. Most important operation is to reduce the unit's speed, then close the field, because less shock is felt if the unit is pulled up into synchronism rather than back.

To further reduce shock cut more resistance into the field circuit before closing the switch so the applied field is weak. Then increase the current and the rotor will lock in step. Caution here is never to cut down the field strength by reducing the exciter voltage at the exciter shunt-field rheostat. At the instant of closing the field switch induced voltage in the generator field winding may be high enough to buck down and reverse the exciter polarity. If there is no rheostat between the exciter and generator field adjust exciter voltage to about ¾ normal and close the field. After the generator pulls in step pick up normal load. Perform these operations without delay and no appreciable disturbance will occur.

I suggest that *RSM* inspect the generator ocb contacts and refill the tank with clean oil. Also examine the field-pole bolts or dovetails for signs of strain or looseness. Field poles some times become loose when the generator falls out of step with its field normally excited.

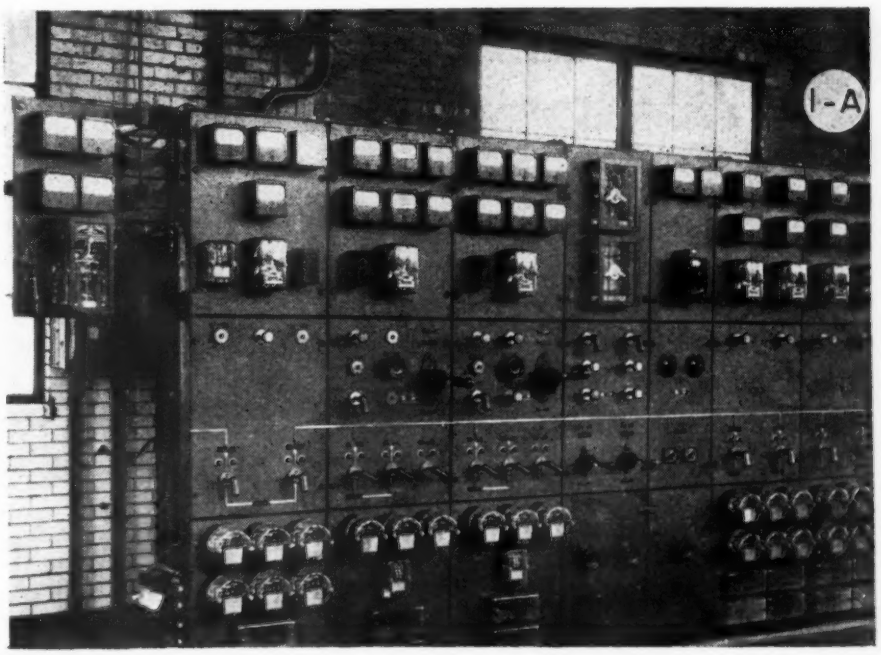
New York, N. Y. L C RINEHART

Fit the Switch With a Latch

ON LOSS OF EXCITATION, the generator momentarily unloads and the prime-mover speed increases. Increase of speed results in the unit operating as an induction generator of sorts.

Inasmuch as the unit is engine driven at 300 rpm, the WR^2 of the rotating parts must be considerable for satisfactory normal operation. Upon re-application of excitation the unit tries to drop back to synchronous speed, but the flywheel effect of the revolving parts opposes this attempt. During this period of time excessive interchange of current takes place between the turbine-driven units and the engine-driven one. While the field-circuit time constant would help to reduce the over-all effect, the resulting currents would certainly be large enough to produce undesirable results.

While removing the generator from the bus and resynchronizing is the proper and safe method to follow, there is a way to accomplish this without opening the generator main switch. Adjust engine governor to a speed at or slightly below synchronous. Turn field rheostat "all in" to produce minimum field current. Close field switch and gradually bring up field current. This results in slight surging, but not to a dangerous degree, as this method is, in effect, the same as "pulling



in" a synchronous motor during starting.

To prevent a recurrence of excitation loss, from the field switch being accidentally opened, I suggest a spring-operated catch fastened to the jaw in such a manner that the blade cannot be opened without pulling the catch clear. Fit it with an insulated knob for releasing it.

Hamilton, Ont. J A COULDEN

Open Field Causes A Voltage Surge

IT IS NOT GOOD PRACTICE, of course, to open a generator field switch under load. It can be reclosed without damage (but not quick enough to hold the machine in synchronism) especially since the machine is smaller than the other two units. There will be a voltage surge, its severity depending upon the amount the machine is out of phase. It will almost certainly be somewhat less than 180 deg.

The unexcited machine will draw a heavy current until the excitation is reestablished but for a few seconds it will do no damage and will probably avert a shutdown if the field switch is closed immediately. However, as stated, this is poor practice and dangerous. It should not be attempted if it can be avoided. The generator will fall out of step if it is not equipped with amortisseur (squirrel cage) windings and in any event with the engine pulling on the load it will not stay in step, and strange as it may seem, will probably race. My advice is not to do it again, but since you probably will have to, it will not wreck the place.

Carlsbad, N. M. E A ROBERTS

Machine Need Not Be Shut Down

RSM SHOULD NEVER RECLOSE the field switch, because no matter how quickly this is done, the engine-driven alternator will be out of phase with the units still on the line. Without an amortisseur winding the unit does not run as induction motor or induction generator.

Proper procedure is as follows: (1) Open the main switch on the engine-driven unit, taking it off the line. (2) If it overspeeds on loss of load, slow it down to normal speed. (3) Insert resistance into the alternator field rheostat. (4) Reclose the field switch. (5) Adjust the voltage to line voltage and resynchronize generator with running units.

It certainly is not necessary to shut the machine down, so long as the main switch is opened and the speed normal.

Princeton, B. C. A R EASTCOTT

Current Interchange

THE FIELD SWITCH can be closed without disconnecting generator from the board.

An emergency method of paralleling ac generators has been used successfully when something has happened to an exciter, so that the exciter voltage was lost or greatly reduced and the lost generator capacity was a minor part of the total generating capacity of the system. The method leaves the generator connected to the main bus and connects another exciter to its field and gradually brings up the exciter voltage to the proper value.

Some of the feeders should be disconnected before using this method. Usually after a certain amount of hunting the generator pulls into step. If the hunting is prolonged and great, disconnect from the main bus and parallel in the usual manner.

Usually large-capacity generators will not pull into step, and induced voltage in the field coils may burn out the insulation on re-exciting. Therefore large generators should be disconnected from the bus and paralleled in the usual manner.

The damage in this case is done when the field switch is opened while the generator is carrying load. It sets a heavy current flowing between the armatures. Field switches should always be opened after the main switch.

S. Vineland, N. J. T DE ROSA

How Do You Tear Down a Brick Chimney?

(This is Question 2 from the April issue, with best answers from readers.)

We would like to tear down a radial brick chimney 115 ft high. It is surrounded by buildings so cannot be pushed or blasted down, and we don't want to pay as much to dismantle it as we did to build it. Will POWER *readers tell us the best way to tear it down in the location described? If their suggested methods involve any construction details please show sketch that we can study thoroughly because we don't want any slip-up or accidents on the job.—GLK*

Use a Hook Scaffold

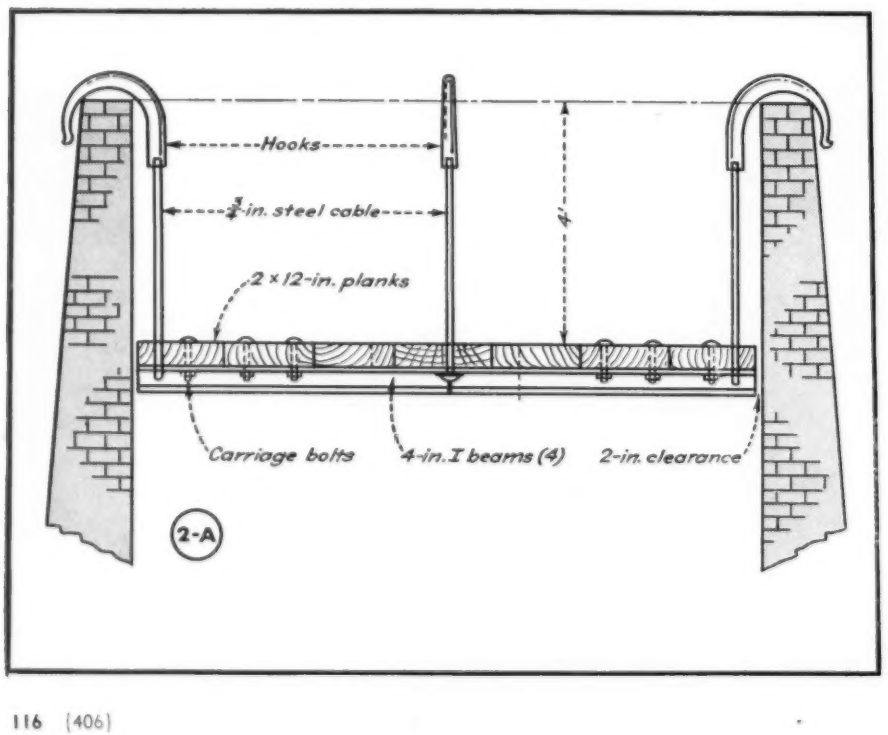
LARGEST PART OF THE WRECKING JOB is building and erecting the scaffolding. Sketch 2-A shows a simple yet efficient scaffold for the job. The layout shows only one thickness of 2x12-in. planks. However another thickness should be added at right angles to these. A small hole approximately 12x12 in. should be cut in center of scaffold for debris to drop through.

Check the local safety regulations before building and using the scaffold. Also suspend it and check for tipping and load carrying capacities.

After scaffold is in place, use two medium weight air hammers to break inside of stack. Outside courses of brick can be knocked in with sledge hammer. Scaffold will descend as work progresses.

Debris may be dropped through hole in center of scaffold and cleaned out of bottom of stack.

Dayton, Ohio C A RUSSELL

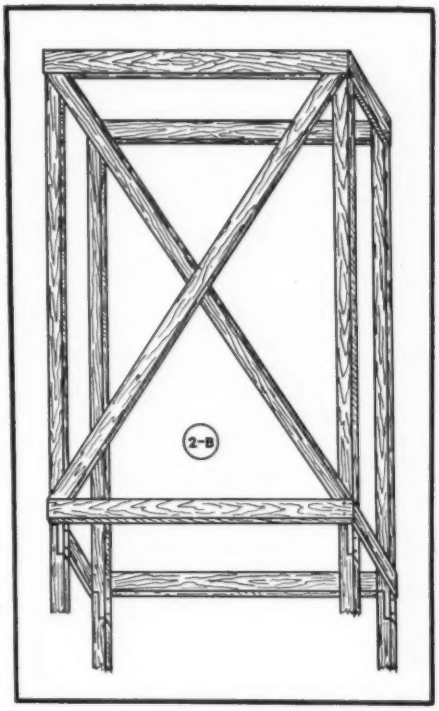


Use Trestle and Chute

I SUGGEST that *GLK* build a scaffold inside the chimney as shown in sketch 2-*B*. The tie around the top of each bent and cross brace is needed to prevent twist.

Suspend a chute inside the trestle from a point 20 ft above ground level. Carry a discharge incline from bottom of chute through the side of the stack. Bolt a piece of heavy rubber belt to the side of the chute and lay it on the slide to absorb shock. A movable hopper on the top completes the job.

Manitoba, Can. W A WYBORN



Try a Chute on the Lower Half of Chimney

TO TEAR DOWN the 115-ft brick chimney, *GLK* should first of all erect a scaffold, preferably of tubular steel. Since the chimney is in a crowded district, the easiest way of tearing down a large part of it is to break off small pieces and let them fall through the chimney to the bottom. This will enable him to bring down about half the chimney.

When that part of the chimney still standing is full of masonry, a chute becomes necessary to bring the brick to ground level.

West New York, N. J. A DI LORENZO

Pipe Scaffold Is Easy to Erect

GLK'S PROBLEM CAN BE SOLVED easily with a minimum of labor and the use of pipe scaffolding, which may be rented or purchased. Pipes can be obtained in various sizes and lengths. If they are purchased they may be used for building maintenance purposes both inside and outside a plant.

Two ladders would be sufficient for men to get to the top of the scaffold. These ladders should have hooked ends that grip the pipe. Planking would be required at each level for the men to stand on, but need not be around the entire chimney except on the top level. Top should be arranged with pipe uprights and chains or a guard rail to protect the men from falling over the side as at (*a*) sketch 2-*C*.

Once the scaffold is erected two men with sledge hammers could knock the brick chimney inward. To expedite the removal of the debris an opening two or three feet square should be made in the base of the chimney. Perhaps an opening already exists. Then inside the chimney pour a circular, sloping mat of concrete, as at (*b*). This would form a chute. When the bricks and mortar fall down inside the chimney they hit the concrete mat and are chuted outside where they may be shoveled into a truck.

Perhaps it would be advisable to build a small wooden channel in front of the opening to guide the debris as it comes out. If the velocity of the material is too great hang a few lengths of chain or a piece of canvas over the opening to slow down the particles.

As each section of chimney is demolished the pipe framework may be disassembled. I've seen this job done and it is quick and efficient, without danger to adjacent buildings.

Tenafly, N. J. K B HOFFMAN

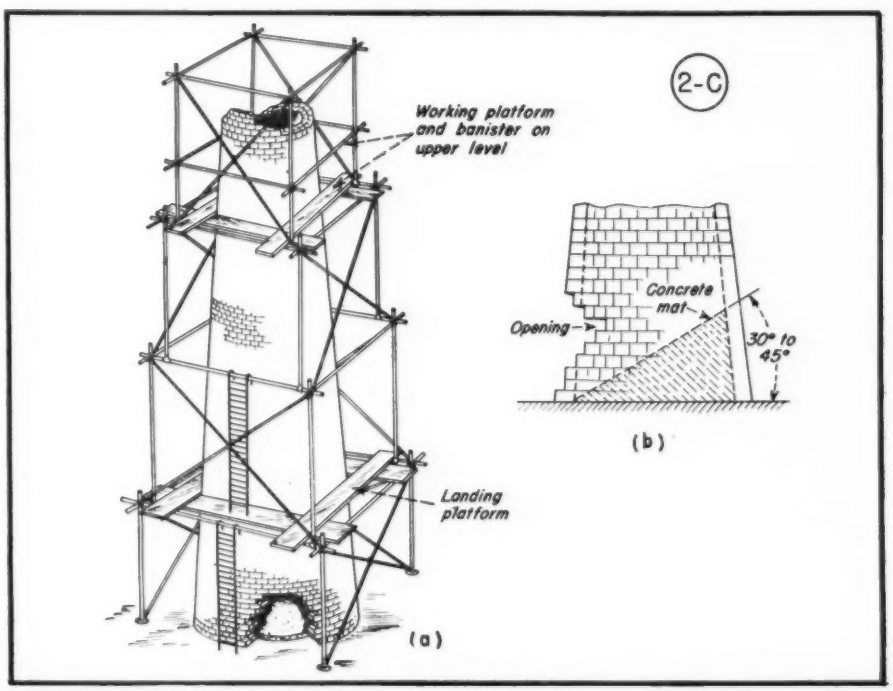
Wrecker Dismantles Top Half of Chimney

GLK'S JOB OF DISMANTLING his 115-ft chimney is a tough one because he will find it difficult to hire riggers and wrecking men experienced in this line of work and to find all equipment necessary for the job. A wrecking permit will have to be given and his men covered by Workmen's Compensation.

I suggest that *GLK* consult a competent chimney-wrecking company as to estimates of cost for dismantling the whole chimney, then ask an estimate of cost for dismantling the top half by dropping the brick inside the chimney until the debris pile becomes nearly level with the remaining part of chimney. There should be a vast difference in the two costs as the wrecker will only handle the brick he dismantles.

If *GLK* dismantles the lower half of the chimney he can lower the material to the outside using the debris for a working platform. This method should be of advantage as the hazardous part of the job will have been done by the wrecker. Purchase of rigging and staging equipment, and the job of securing skilled riggers and wrecking men would be practically eliminated.

Montreal, Canada ARTHUR BELTON



CENTRIFUGAL PUMP Q&A FOR POWER ENGINEERS

By I J Karassik and Roy Carter

16—Recommended Operating Practices

Sixteenth in a monthly series by Igor J Karassik and Roy Carter, Worthington application engineers. These two experts on centrifugal pumps have selected questions and answers that give a broad, practical understanding of the pumps, their construction, operation, characteristics, troubles and remedies.

Q 1—Should a pump be started with the discharge valve open or closed?

A—Power curves of high- and medium-head pumps rise from shutoff (no delivery) to normal operating condition. For this reason, start such pumps against closed discharge valve to reduce the driver's starting load. A bypass may sometimes be necessary to prevent overheating the pump, as in a boiler-feed installation.

Power curves of low-head pumps of mixed flow and propeller types generally rise sharply with capacity reduction. Therefore start these pumps with their discharge valve open.

Q 2—How is a standby boiler-feed pump held ready for operation?

A—It is held ready with suction and discharge gate valves open, the discharge check valve closed to prevent reverse flow through the pump. To maintain the idle pump at near operating temperature, feedwater flows through it from the open suction through the warm-up valve between pump and discharge check valve. To avoid wasting feedwater warm-up valve drains return to the feed cycle at a lower-pressure point than the feed pump suction. In an emergency a cold pump may be put in operation without warming up. However, it should be heated for about 30 minutes before starting.

Q 3—Can the suction of a pump be throttled to reduce its delivery?

A—Throttling a pump's suction reduces the absolute pressure at the impeller's inlet. This can reduce its capacity by forcing the pump to operate "in the break." Such operation is harmful unless like a condensate pump, the unit is specifically designed for such service.

Throttling the suction may be permissible in special cases when suction pressure exceeds the minimum required by a good margin, such as on the second pump of a series unit. Here the effect is not to reduce capacity but to reduce total head generated by the series unit.

Generally, throttling at the suction is harmful and should not be done because throttling the discharge gives as satisfactory results.

Q 4—If a motor-driven pump stops because of power failure, does it start automatically upon resumption of current?

A—This depends on the motor control. Starters are made with low-voltage protection, with low-voltage release, and without either. Low-voltage protection trips the motor off on low voltage or power failure and the motor cannot start

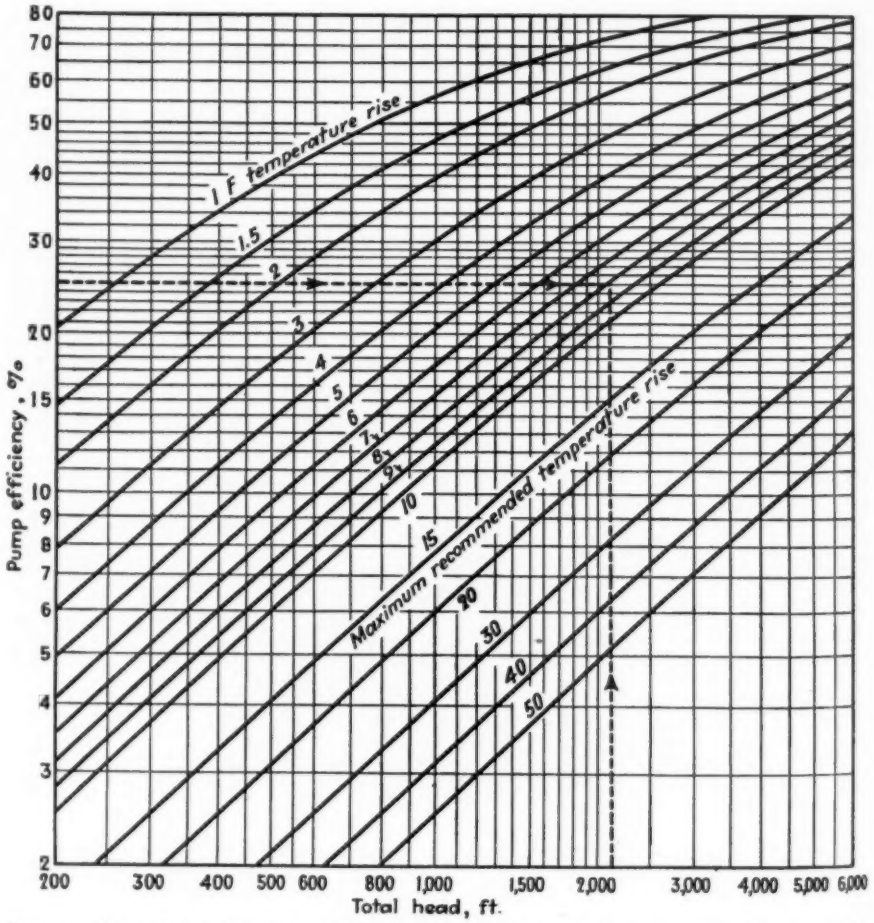
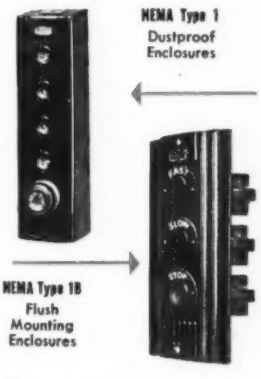


Fig. 1—Chart for determining temperature rise in centrifugal pumps when operating under a given total head and efficiency on the performance curves of the pumps



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PUMP Q&A

Continued

again until the low-voltage trip has been reset manually. Starters with low-voltage protection can be used only with momentary-contact pilot devices and not with maintained-contact pilot devices, such as float switches, unless they are provided with an auxiliary relay. Except where the starters have low-voltage protection, resumption of power starts the pump automatically.

Pumps operating on a suction lift may lose their prime during the period that power is off. Starters with low-voltage protection are desirable for such installations unless the pumps are automatically primed or cannot be started unless primed.

Q 5—Can a pump run without liquid?

A—Most pumps have close clearance leakage joints and cannot be run dry for more than a few seconds without damage. With one design of automatic priming, the pump starts dry when the vacuum pump starts. The unit runs dry for not over two minutes. To insure successful operation, wearing-ring clearance is made slightly larger than normal.

Q 6—Why do pumps overheat when operating with closed discharge?

A—In a centrifugal pump, the difference between horsepower input and water horsepower is lost in the unit. This power loss is converted into heat and transferred to the liquid passing through the pump. When operating at shutoff, power losses equal shutoff horsepower. Since there is no flow through the pump, all power goes into heating the small quantity of liquid in it, causing the casing to heat. If heat added to the liquid is small, it can be dissipated with a low temperature differential between liquid in the casing and the surrounding atmosphere. With high power losses, liquid temperature might have to exceed boiling temperature at suction pressure, before the heat dissipated equals that generated in the pump, a condition to avoid.

Q 7—Do size and type have any effect on a pump's overheating at shutoff?

A—Yes. Rate of liquid heating in a casing for a given power loss is determined by liquid volume in the casing and its surface available for heat dissipation. If total power losses equal 100 Btu per sec, and the pump contains 100 lb of water, water temperature will increase at the rate of 1 F per second. With a low-head high-capacity pump that contains 5000 lb of water, temperature rate increase will be only 0.02 F per second. These rates progressively decrease as temperature increases because of an increasing radiation and convection rate. When the volume is relatively small, as in a high-pressure pump, overheating is rapid while a large-capacity low-head pump with equal total power losses may operate against shutoff for hours without serious difficulty.

Q 8—What determines minimum permissible capacity to prevent overheating a pump?

A—Inasmuch as temperature rise varies with pump capacity, minimum permissible capacity depends on maximum permissible temperature rise. The latter varies over a wide range depending upon the installation. For boiler-feed pumps it is generally recommended to limit water temperature rise in a pump to about 15 F. When a pump handles cold water, higher temperature rises are permitted, up to 50 or even 100 F. Minimum permissible capacity, then, is that at which liquid temperature rise corresponds to maximum permitted.

Q 9—How does one determine temperature rise?

A—Assuming that the pump handles water, its temperature rise can be determined by multiplying the difference between the horsepower input and water horsepower by 2545 (Btu equivalent of 1 hphr) and dividing this product, the total heat imparted to the water, by the corresponding flow in pounds per hour. A more easily calculable relation is:

$$\text{Deg. F rise} = \frac{\text{total head at pumping rate}}{778} \times \left(\frac{1}{e} - 1\right)$$

where e equals pump efficiency at pumping rate. When liquids other than water are handled, correct the resulting answer for the difference in specific heat.

The chart, Fig. 1, gives a quick way of determining liquid temperature rise. From the pump's performance curve determine total head and efficiency for a given discharge. Assume 2100-ft head and 25% efficiency. Projections from these values on the chart intersect on the 8-F temperature-rise curve, which is well within the 15-F maximum recommended limit. If the pump has an axial

(*Continued on page* 142)

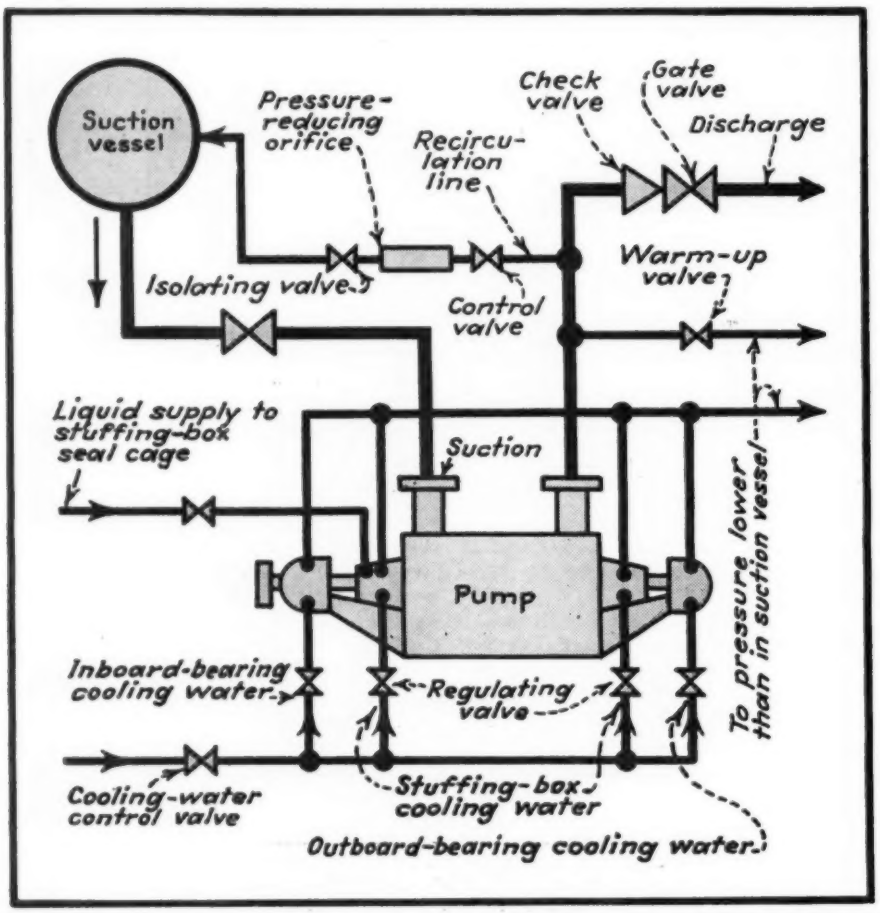
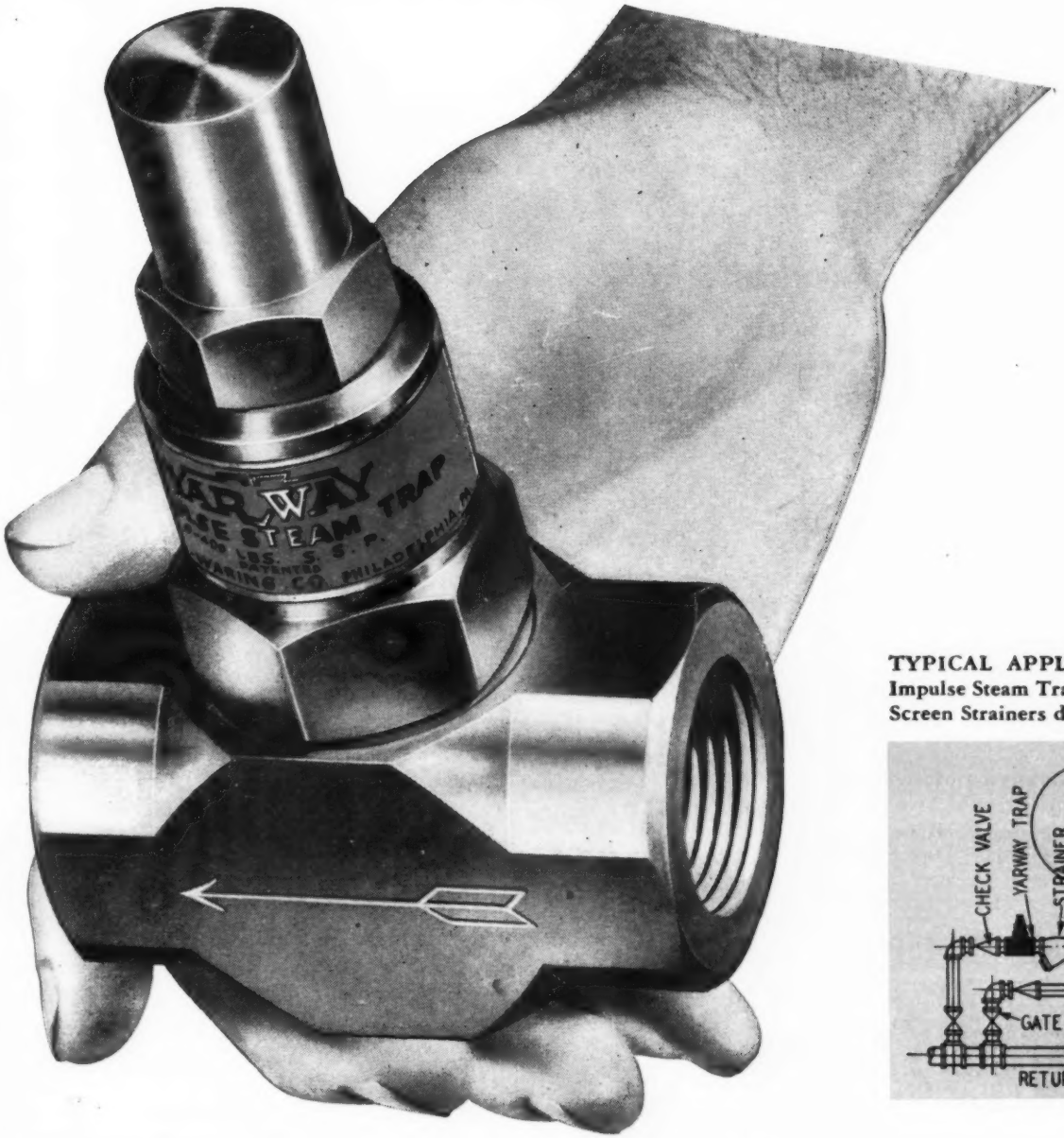
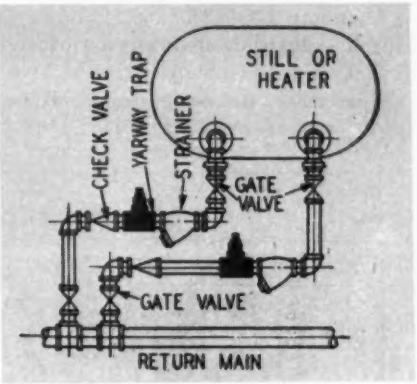


Fig. 2—Schematic diagram shows an imaginary centrifugal pump provided with all the possible in-and-out auxiliary connections that may occur in any installation



TYPICAL APPLICATION — Yarway Impulse Steam Traps with Yarway Fine-Screen Strainers draining liquid heater.



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MATH TIPS

PHIL SWAIN GIVES HELPFUL HINTS TO EVERYDAY USERS OF NUMBERS AND HOMESPUN MATHEMATICS

⑬—Logs Multiply and Divide

► BEFORE STARTING THIS PAGE reread the first two installments on logarithms, POWER, April, p 120 and May, p 120.

Remember the rules: *Add logs to multiply, subtract to divide.*

Problem: 2.856x8531 = ?

Solution:	*Number*	*Log*
	2.856	0.4558
	8531	3.9310
	Sum	4.3868, log of 24,370

Therefore 2.856x8531 = 24,370.

Note that this answer is not exact, and that solutions obtained by logs or by slide rules are never exact. However, you can always find a log table with enough places to give any required degree of precision.

Problem: 72.16x0.04137 = ?

Solution:	*Number*	*Log*
	72.16	1.8583
	.04137	2.6167
	Algebraic sum	0.4750, log of 2.985

So 72.16x0.04137 = 2.985

Problem: 0.003216 ÷ 0.5215 = ?

Solution:	*Number*	*Log*
	0.003216	$\bar{3}.5073$
	0.5215	$\bar{1}.7172$
	Algebraic diff	$\bar{3}.7901$, log of 0.006167

Here the algebraic difference was $0.5073 - 3 + 1 - 0.7172 = -2.2099 = \bar{3}.7901$

Problem: 253.2x14.6x.0146 ÷ 82.3 ÷ 539.3 = ?

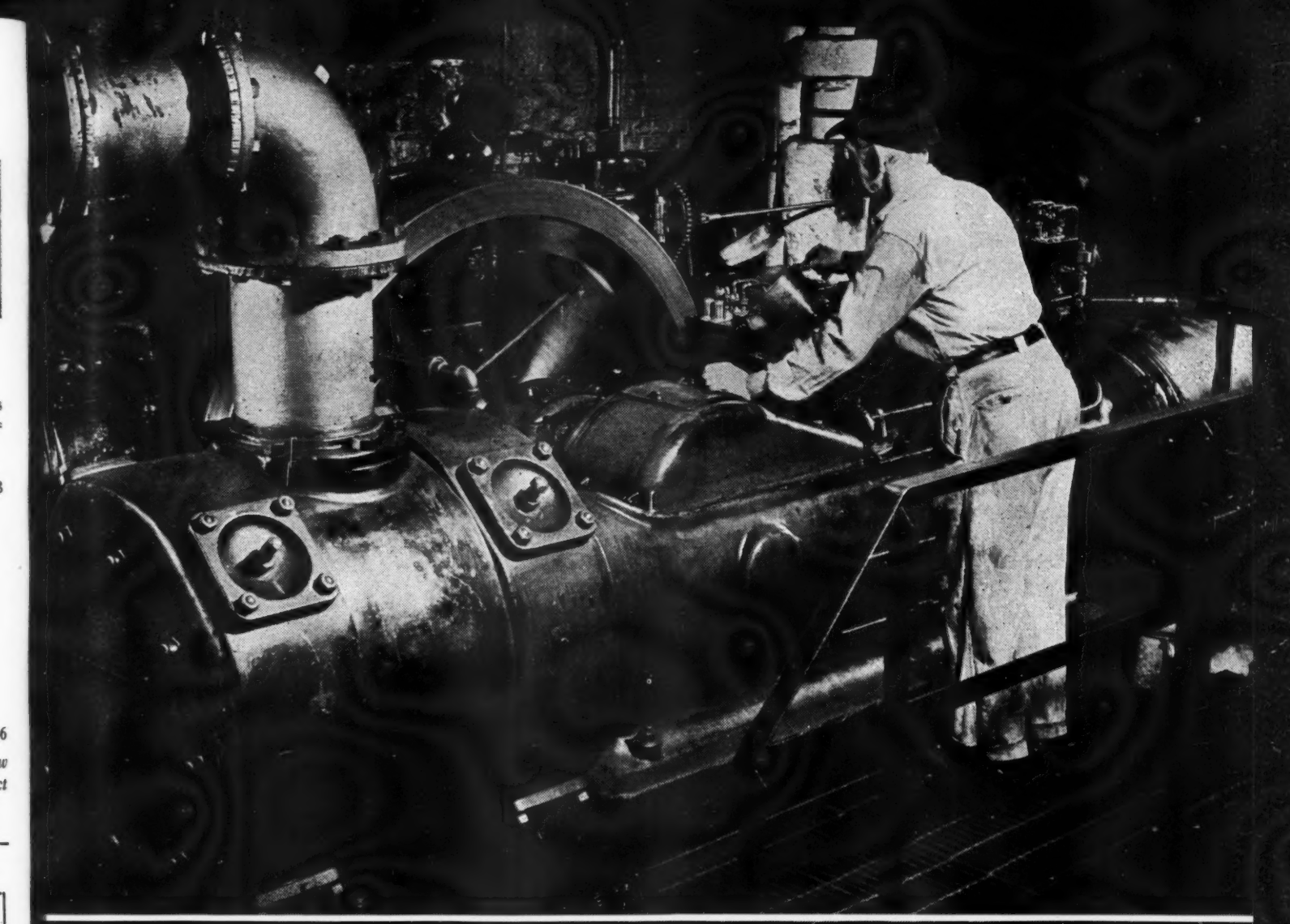
Solution:	*Number*	*Logs to add*	*Logs to subtract*
	253.2	2.4034	
	14.6	1.1644	
	.0146	2.1644	
	82.3		1.9154
	539.3		2.7318
		1.7322	4.6472
	Less	4.6472	
		$\bar{3}.0850$ = log of 0.001216	

Next month's installment will show how to use logs to find powers and extract roots, an extremely useful application.

Four-place Common Logarithms of Numbers

No.	0	1	2	3	4	5	6	7	8	9	Ave. diff.
1.0	0.0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	42
1.1	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	38
1.2	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	35
1.3	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	32
1.4	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	30
1.5	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	28
1.6	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	26
1.7	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	25
1.8	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	23
1.9	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	22
2.0	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	21
2.1	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	20
2.2	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	19
2.3	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	18
2.4	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	17
2.5	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	
2.6	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	16
2.7	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	
2.8	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	15
2.9	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	
3.0	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	14
3.1	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	
3.2	5052	5065	5079	5092	5105	5119	5132	5145	5159	5172	13
3.3	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	
3.4	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	
3.5	5441	5453	5465	5478	5490	5502	5515	5527	5539	5551	12
3.6	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	
3.7	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	
3.8	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	11
3.9	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	
4.0	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	
4.1	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	10
4.2	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	
4.3	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	
4.4	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	
4.5	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	
4.6	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	
4.7	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	9
4.8	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	
4.9	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	
5.0	0.6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	9
5.1	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	8
5.2	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	
5.3	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	
5.4	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	

No.	0	1	2	3	4	5	6	7	8	9	Ave. diff.
5.5	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	
5.6	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	
5.7	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	
5.8	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	7
5.9	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	
6.0	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	
6.1	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	
6.2	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	
6.3	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	
6.4	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	
6.5	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	
6.6	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	
6.7	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	6
6.8	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	
6.9	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	
7.0	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	
7.1	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	
7.2	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	
7.3	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	
7.4	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	
7.5	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	
7.6	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	
7.7	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	
7.8	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	
7.9	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	5
8.0	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	
8.1	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	
8.2	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	
8.3	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	
8.4	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	
8.5	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	
8.6	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	
8.7	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	
8.8	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	
8.9	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	
9.0	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	
9.1	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	
9.2	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	
9.3	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	
9.4	9731	9736	9741	9745	9750	9754	9759	9764	9768	9773	
9.5	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	
9.6	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	4
9.7	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	
9.8	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	
9.9	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	



Softening up A HARD CARBON PROBLEM

SUN COMPRESSOR LUBRICANT...

Eliminates Monthly Shutdowns; Increases Valve Life by 36 Times

Production in a big chemical plant was being slowed down by monthly compressor shutdowns, caused by hard carbon and breakage of valves.

New valves were installed at least once a month. Shutdowns for cleaning were scheduled every four months. Something had to be done about it.

The picture changed when the plant switched to a Sun "Job-Proved" oil. One set of valves has now lasted more than three years. The compressor is now down only once a year for general checking and cleaning.

In hundreds of jobs like this, Sun compressor oils have proved they do not form hard carbon, do not break down into sticky, gummy sludge. For long, trouble-free operation of compressors, Diesels, turbines, or other major power equipment, call the Sun Engineer near you today.

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

Sponsors of the Sunoco News-Voice of the Air—Lowell Thomas

SUN

SUNOCO

INDUSTRIAL PRODUCTS

HOW TO TEST BOILER WATER BY CONDUCTIVITY

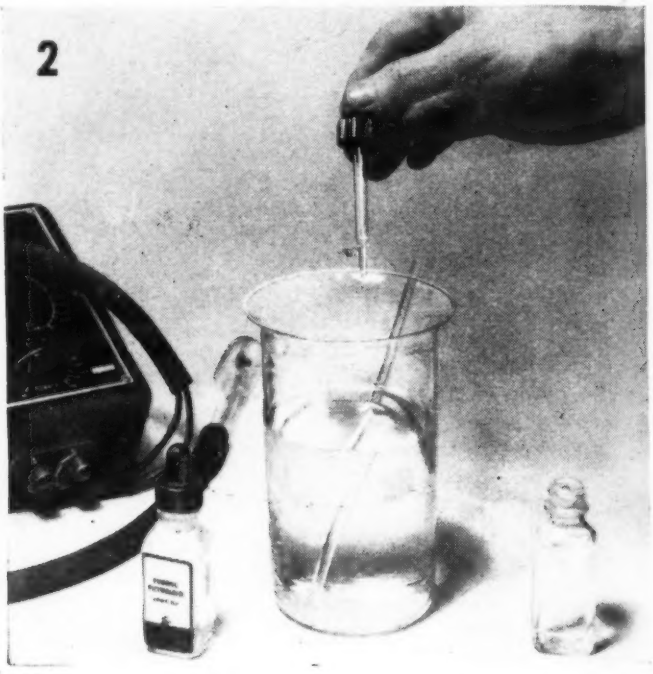
By C A NOLL, *chief chemist, W H and L D Betz*

▶ CONDUCTANCE, which is the opposite of electrical resistance, is determined for boiler water by the concentration of various ionized salts present in solution. It is therefore a measure of the dissolved-solids content, and thus can be used as a guide for boiler blowdown. (Condensate is tested the same way to determine the steam's purity, but the test results must be corrected for conductance caused by dissolved gases such as ammonia and carbon dioxide.)

Ionizable solids in boiler water cause the solution to conduct electricity: the higher the concentration the greater its conductance. Because pure water, free of ionizable solids, has high resistance, a check on the dissolved-solids concentration is obtained by measuring the solution's electrical resistance. Test device consists of an electric cell, indicating instrument that can be calibrated in either resistance or conductance, and a source of potential.

Limitations: The conductance method below does not measure organic matter and it is necessary to use a conversion factor to express conductance reading in terms of ppm solids. Relationship between the specific conductance and dissolved-solids content depends on the water's characteristics and may be different for each plant. An average value determined over a wide scale of operating conditions is that one micromho of conductance is equivalent to 0.85 ppm for water when it is highly colored, and 0.76 when it is not.

Proper relationship can be established for each plant by making a series of tests over a several-week period to obtain ratio between solids and conductance.



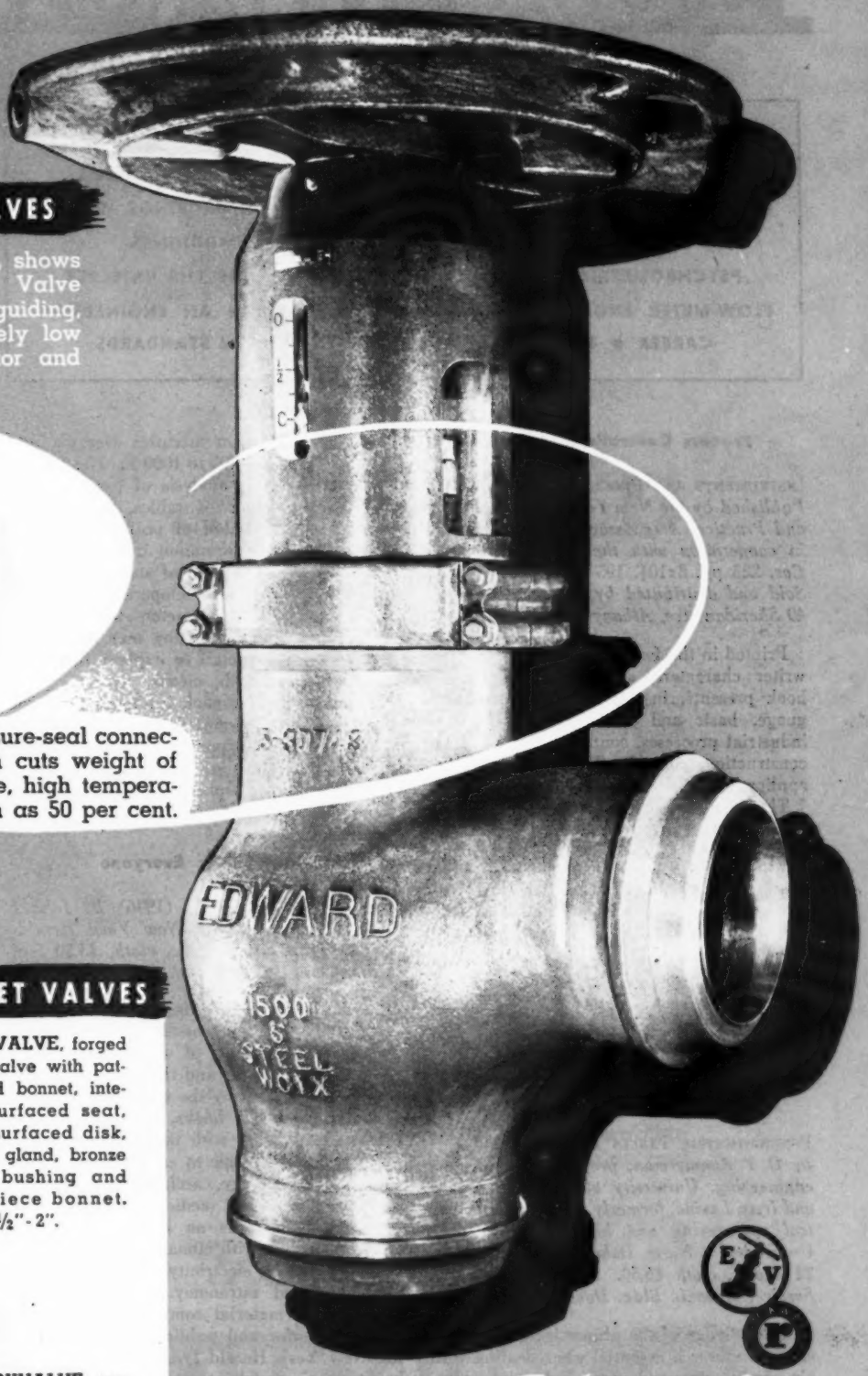
1 Pour about 100 ml of clear boiler water into a 250-ml flask. Use water that has settled, but do not filter it. Next, transfer 20 or 30 ml to a glass cylinder. Add four drops of phenolphthalein indicator to the transferred sample in the glass cylinder, as shown.

2 By alternately adding boiler water from the flask and a 5% sulphuric-acid solution, neutralize about 50 to 60 ml of the boiler water until a pale pink color just appears.

3 Immerse the electrode cell several times in distilled water to remove any foreign residue. Insert it in the boiler sample, moving it up and down to effect thorough wetting. Measure the solution's temperature, set compensating knob accordingly and adjust bridge circuit to read the conductance of the sample in the glass cylinder.

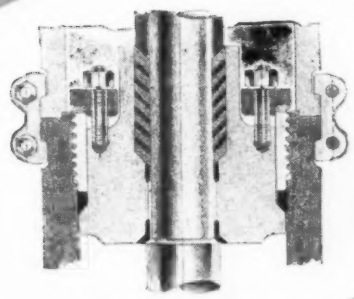
New!

TWO Edward Designs FOR TOP PRESSURE-TEMPERATURE OPERATING CONDITIONS



PRESSURE-SEALED BONNET VALVES

NON-RETURN VALVE, at right, shows Edward pressure-seal design. Valve incorporates flow directional guiding, internal contouring for extremely low pressure drop, closure indicator and Edward Impactor handwheel.



Principal parts of pressure-seal connection. This construction cuts weight of standard high pressure, high temperature valve by as much as 50 per cent.

SMALL SEALED BONNET VALVES

Edward **UNIVALVE**, forged steel globe valve with patented welded bonnet, integral hard-surfaced seat, hard-surfaced disk, bolted gland, bronze yoke bushing and one-piece bonnet. Sizes ½"-2".

See how **UNIVALVE** construction keeps body and bonnet in perfect alignment for welding, cuts pressure drop, reduces erosion-producing turbulence, yet keeps features of globe valve tightness.

Edward Valves, Inc.

SUBSIDIARY OF ROCKWELL MANUFACTURING COMPANY

EAST CHICAGO, INDIANA

EXPECT THE BEST IN NEW STEEL VALVE DEVELOPMENTS FROM EDWARD!

FOR THE ENGINEER'S BOOKSHELF

BOOKS REVIEWED IN THIS ISSUE

INSTRUMENTS AND PROCESS CONTROL • HIGH VACUUM TECHNIQUE
PROCEEDINGS: SMOKE PREVENTION ASSOCIATION OF AMERICA
GRINDING WHEELS AND THEIR USES • MECHANICAL PACKINGS MANUAL
PROTECTION OF ELECTRIC CIRCUITS AND MACHINES
PSYCHROMETRIC TABLES AND CHARTS • YOU AND THE UNIVERSE
FLOW-METER ENGINEERING HANDBOOK • BUILDING AN ENGINEERING CAREER • 1945 SUPPLEMENTS TO BOOK OF ASTM STANDARDS

Process Controllers Explained

INSTRUMENTS AND PROCESS CONTROL (1945) *Published by the New York State Vocational and Practical Arts Association and prepared in cooperation with the Taylor Instrument Cos.* 233 *pp*, 8x10¾, 195 *illust, paper*, $2.75. *Sold and distributed by Delmar Publishers, 49 Sheridan Ave, Albany 6, N. Y.*

Printed in the form of a manual with typewriter characters, single-space typing, the book presents, in simple nontechnical language, basic and detailed information on industrial processes, controller operation and construction, control valves and instrument application.

The manual should interest students in the field of process control because the theory is explained with sketches and drawings; the many different controllers are shown schematically so their working principle is easily followed.

Considerable space is devoted to controller application, mechanism adjustment and instrument maintenance. Thus engineers may find the answers to some of their operating and maintenance problems as well as new ways to apply mechanical control.

Handy Psychrometric Data

PSYCHROMETRIC TABLES AND CHARTS (1945) *by O T Zimmerman, professor of chemical engineering, University of New Hampshire, and Irvin Lavine, formerly, professor of chemical engineering and head of department, University of North Dakota.* 162 *pp*, 8½x11, 22 *charts, cloth* $6.50. *Industrial Research Service, Masonic Bldg, Dover, N. H.*

A knowledge of the properties of air-water vapor mixtures is essential when dealing with air conditioning and many industrial operations such as drying and refrigeration. For many of these purposes data must be available over temperature ranges beyond those encountered by the human body. Tables and charts in this book provide useful data essential to anyone having occasion to deal with air-water vapor mixtures over the temperature range, —100 to 1000 F. The authors present a concise analysis of psychrometric theory, 116 pages of tables, 22 full-page charts and a number of problems to illustrate how the information can be used in practical work. Instead of stating that wet-bulb temperature is the temperature indicated by a wet-bulb thermometer—which is the explanation found in many text books—the authors go into detail to explain just what the term, wet bulb, means.

Contents include such information as volumes and enthalpies of dry air, water vapor, and saturated and partly saturated air; saturation humidities at one atmosphere and various other atmospheric pressures and humidities along percentage-saturation curves.

Science for Everyone

YOU AND THE UNIVERSE (1946) *By John J O'Neill, science editor, New York Herald-Tribune.* 328 *pp*, 6x9 *in., cloth*, $3.50. *Ives Washburn, Inc, 29 W 57th St, New York* 19.

"What Science Reveals," the subtitle, admirably describes the book's contents. It is an adventure for any of us who have curiosity about ourselves and the world in which we live as revealed by the scientist. The text is divided into two books, one dealing with man and the other with the universe. Book one devotes a chapter to each of seven subjects: Anthropology, archaeology, zoology, biology, physiology, medicine and psychology. Book two has an equal number of chapters dealing with climate, geology, mathematics, physics, electricity, engineering and chemistry, and astronomy.

All of the material comprising this book was written for and published originally in the New York Herald-Tribune. The author has written enough science stories for that newspaper to fill 6000 book pages. From these he has selected material for 300 pages to present a story of what science has accomplished in the last ten years.

Essentially a newspaper man, the author has developed the knack of presenting scientific subjects in simple, easily understood language. The book is good reading for both layman and engineer because a grasp of scientific ideas is important when attempting to visualize what the future may hold as well as to understand the past.

Protective Electric Devices

PROTECTION OF ELECTRIC CIRCUITS AND MACHINES (1946) *By C F Hedlund, electrical engineer, and A L Brown, chief engineer, Factory Mutuals.* 72 *pp*, 8½x11, 96 *illust, stiff paper*, $2. *Associated Factory Mutual Fire Insurance Companies*, 184 *High St, Boston* 10, *Mass.*

Explaining and amplifying certain features of the National Electrical Code, this book covers the how and why of safeguarding wiring, machinery and equipment from the dangers of short circuits and overloading. Approved fuses, breakers, relays and thermal devices are described, and their application to the protection of generators, transformers and motors is shown by simplified wiring diagrams with descriptive notes and Code references.

Purpose of the book is to develop a clearer understanding of the need of proper protective devices, the lack of which has been a chief factor in the increase in fires of electrical origin in industrial plants in recent years. The information is particularly timely for those plants that are installing new equipment or revamping and improving their present electrical installations.

ASTM Standards

1945 SUPPLEMENTS TO BOOK OF ASTM STANDARDS. *Parts* I, II, *and* III, $4 *each, cloth;* $6, *heavy leather. American Society for Testing Materials*, 1916 *Race St, Philadelphia* 3, *Pa.*

The 1945 Supplements, in three parts, give some 230 specifications, tests and definitions, first issued in 1945 or revised since their appearance in the 1944 book.

Part I on Metals, 395 pp, includes over 85 standards covering ferrous and non-ferrous materials. Section on ferrous metals includes: steel, wrought iron, pig iron, etc (9); electrodeposited coatings (8); three general testing methods. Nonferrous specifications and tests include: copper and copper-alloy products—tubes, strip, etc (32); copper and copper-alloy castings (8); lead and lead alloys (2); anodic coatings (3); copper wire (8); electric furnace alloys; magnesium and its alloys (7); materials for radio tubes, electronic devices, and lamps (7); and metal powder bearings.

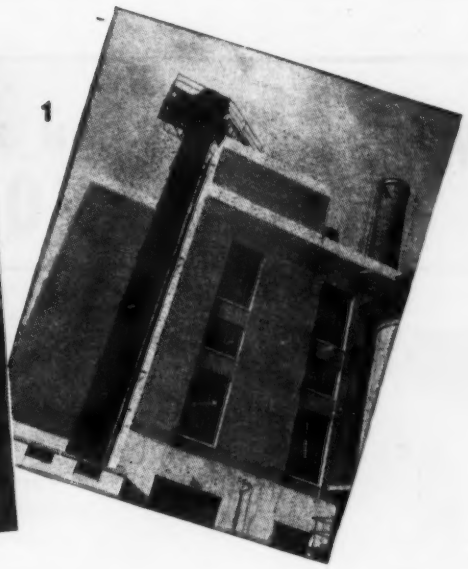
(*Continued on page* 146)

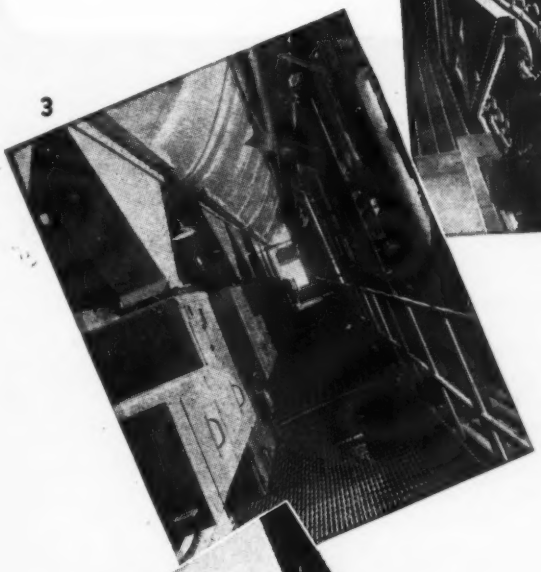
1—Bucket elevator hoisting coal to 600 ton bunker.

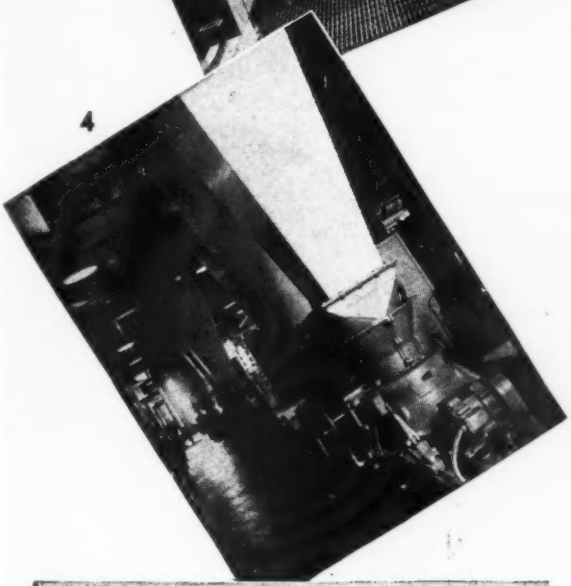
2—Flight conveyor over bunker.

3—Bunker, concentrating chutes and scales.

4—Chutes from scales and gates to pulverizer feeders.







Above: Ground storage elevator forming initial pile from which point coal is stored by bulldozer shown.

Engineering the Equipment to fit the need

FAIRFIELD

Coal Handling SYSTEM

Existing conditions—plant location—type of structure—all are factors in determining the most satisfactory method of handling coal in the modern power plant.

Shown is a typical example of how Fairfield engineered a complete coal handling system from car to storage to bunker to pulverizers—with minimum of labor required and with full automatic handling—at the rate of 75 tons per hour.

The plant has four 100,000 lb. boilers fired by pulverized coal. The coal is handled automatically from car by means of a track hopper — reciprocating feeder and bucket elevator and chute to initial pile for ground storage. A bucket elevator hoists coal to suspension type steel bunker inside the power plant from which concentrating chutes deliver it to automatic scales and gates to pulverizer feeders.

Consult Fairfield on your coal and ash handling systems. They have the experience — the engineering "know how" — the facilities for designing — building and erecting the complete system.

THE FAIRFIELD ENGINEERING CO.

Builders of Coal and Ash Handling Equipment

320 CHICAGO AVENUE • • • MARION, OHIO

WHAT'S New IN PLANT EQUIPMENT

Fan-Cooled Motor

FOR DUSTY, DIRTY and corrosive atmospheres, new totally inclosed fan-cooled motor is available in standard, explosionproof and dust-explosionproof designs from 1 to 1000 hp. Motor serves where iron dust and metal filings are in the air and in hazardous locations of Class I, Groups C and D, and Class II, Groups E, F and G. Short in length and compact in construction, motor may be installed in a small space.

Low starting current, with balanced design, makes the new *Tri-Clad* suitable for full-voltage starting, thus permitting simple, inexpensive control equipment. Motor has high pull-up torque for snappy acceleration and high maximum running torque to meet temporary abnormal peaks and low-voltage conditions. **Dept P, General Electric Co, Schenectady, N. Y.**

Built-In Coupling

A SIMPLE COUPLING, which makes possible a 10-sec joining and disconnection of individual sections of flexible tubing, has been developed for Spiratube, a noncollapsible retractable tubing. Warner coupling is built into the tubing, eliminating fittings. The coupling, a flat-spring steel collar, may be compressed to slip inside the end of another section and then released to form a strong, tight joint. Sections are easily disconnected by compressing inner-spring steel collar and withdrawing male end.

Warner couplings, like the rest of tubing, are covered with long-fiber duck fabric, which has been processed to be fire resistant and coated with a tough, durable thermoplastic. There is no exposed metal inside or out, which makes Spiratube safe in presence of explosive or inflammable materials. Spiratube is furnished in standard diameters from 3 to 16 in. and in lengths of 10, 15 and 25 ft. **Dept 129, Spiratube Division, Warner Brothers Co, Bridgeport 1, Connecticut.**

Cartridge Snubber

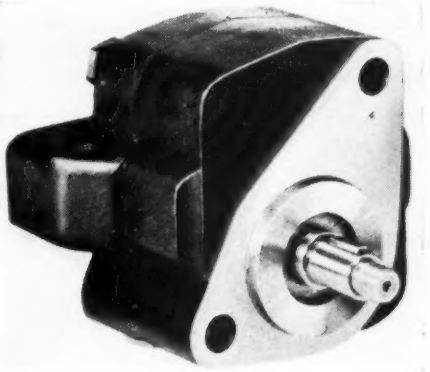
NEW HELICOID SNUBBER, or pulsation dampener, takes advantage of use of powdered metal through which pressure medium must pass. Compressed powdered metal is in form of a cartridge, which can be inserted directly in gage socket, or in a small separate connecting piece attached to gage socket. Compressed powdered metal is made in various porosities for air or gas, for water or steam, or for oil. Cartridge snubber is effective for reducing or eliminating violent pressure pulsations. **Dept P, Helicoid Gage Div, American Chain & Cable Co, Bridgeport 2, Conn.**

Switchboard Tachometers

HEADS OF ELECTRIC SWITCHBOARD TACHOMETERS consist merely of a simple contact-making mechanism, which is connected to indicating unit by an electric cable. This cable may be any length up to 1000 ft. These oscillating contacts periodically charge a condenser through a dc milliammeter. The circuit constants are chosen so that milliammeter does not correspond to each charge but reads the average current. Circuit was designed so that the current is exactly proportional to rpm of spindle which operates contacts.

Special limited-range models are available for continuously monitoring specific speeds. Models with multiple heads for monitoring several spindles simultaneously or in succession are available, as well as continuously recording models.

A variety of heads are obtainable for fitting any kind of machine. Tachometers may be single- or multi-range. Units for linear speeds as low as ¼ ft per min and for rotational speeds as low as 1 revolution per min may be supplied. Operation is from the 115-v ac power line. No vacuum tubes or warm-up are required. **Dept P, Metron Instrument Co, 430 Lincoln St, Denver 9, Colo.**



Gear Hydraulic Pump

MODEL H657-A UNIT delivers pressure up to 2000 psi with 5½ gpm at 2800 rpm. It is suitable for hydraulic systems ranging from 100 to 2000 psi. Simplified construction and high efficiency are claimed for the pump, which employs Nitralloy gears in CI body of "sandwich" design. It provides ample porting to standard pipe sizes and mounting flange adaptable to equipment. Unit is about 3½-in. cube, with ½ in. dia x $\frac{1}{16}$-in. drive shaft extension, plus threaded portion for ⅜-in. nut. **Dept P, Aro Equipment Corp, Bryan O.**

Air-Operating Valve

FITTED WITH A HAND-OPENING LEVER and a rotatable pivot so the lever can be located in any position, *Type BA* self-sealing air-operating ball-design valve can be opened instantly from almost any position with either a horizontal or vertical pull. Ball valve closes tight with inlet pressure, and will not collect dirt or other foreign matter. Stuffing box is not accessible to tampering or adjustment and is self-packed by oper-

POWER brings this monthly survey of new equipment as one of its many reader services. In requesting additional information from manufacturers, please identify the source of your inquiry by referring to Dept. P

Reconversion ...use COPPER TUBES *for Pipelines*

ARE YOU FACED with the necessity of installing pipelines to handle hot or cold water... compressed air... gases... refrigerants... oils or other fluids? Then consider the economies made possible with copper tubes:

Though the purchase cost of such tubes may be higher than that of rustable pipe, *installed cost* is often lower. For copper tubes are light in weight, smaller diameters can usually be employed, and the use of solder type fittings leads to substantial savings in erection costs.

In service, copper tubes prove economical right from the start. The soldered joints remain sound and leakproof, and the smooth, rust-free interior of corrosion-resistant copper reduces the possibility of built-up deposits, permits increased flow, and long, dependable service.

For detailed information on Anaconda Copper Tubes and their industrial application, write for Publication C-24. 4899

ANACONDA

Anaconda

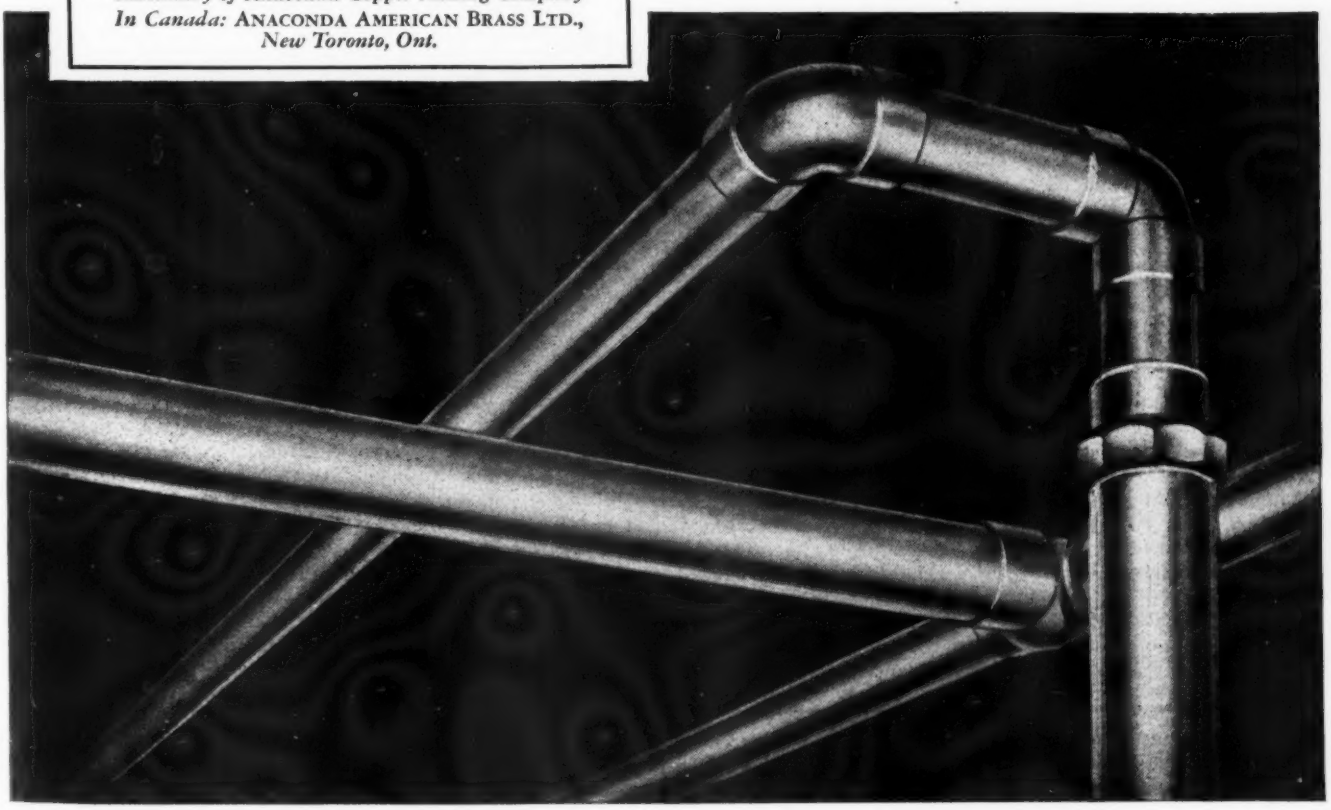
COPPER TUBES

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*



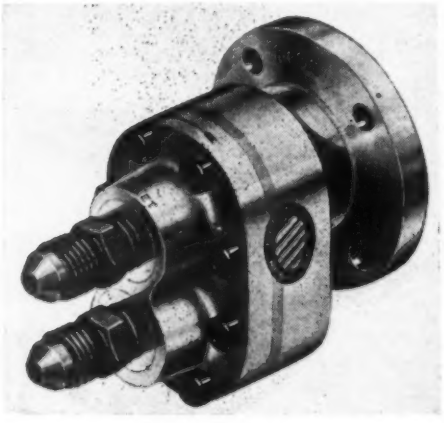
EQUIPMENT *Continued*

ating pressure when valve is open, permitting flow. Operating pressures up to 200 psi are recommended.

When fitted with a cam-operated lever, this valve becomes *Type BAC* and permits instantaneous valve opening and closing by throwing lever in desired direction. Lever is held in position thrown until manually returned to original position. Yoke-supporting lever can be rotated around valve bonnet to any desired location. Enlarged lever end provides easy visual check on inner-valve position. **Dept P, Leslie Co, 255 Grant Ave, Lyndhurst, N. J.**

Titration Indicator

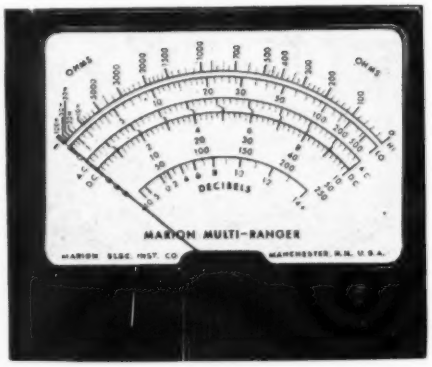
IN ALKALINE SOLUTION, Fleisher methyl-purple indicator exhibits an emerald-green color; in an acid solution, a purple color. An intermediate steel-gray tint provides a convenient warning of the approaching end-point. Color changes are sharp and distinct, and of such contrast as to make their perception definite. Color transitions take place over a narrow pH differential. Accuracy is unimpaired in the presence of the phosphate ion, a normal constituent of treated boiler water. Only two drops per 100-ml sample are sufficient for a titration. **Dept P, Fleisher Chemical Co, Benjamin Franklin Station, Washington 4, D. C.**



Pressure-Lubrication Pump

SERIES 1200 pump serves for pressure lubrication of bearings of diesel engines, turbines, machine tools, generators and other high-speed and heavy machinery, and in fluid handling in aircraft at high altitudes. This direct-drive gear pump is a small 8-oz unit. Three standard models displace from .08 to 1.5 gal per min at speeds ranging from 1140 to 3450 rpm against pressures up to 150 psi.

Standard models are for direct-motor application, but pumps may be furnished for flange mounting, belt, spline and other drives. Power requirements vary between 1/100 to 1/6 hp. Pump body is of aluminum, with nitrided nitralloy spur gears and shafts. **Dept P, McIntyre Co, 15 Riverdale Ave, Newton 58, Mass.**



Instrument Equipment

MARION MULTI-RANGER permits operator to assemble an accurate instrument to serve as a 2500-ohm-per-volt or as a 1000 ohm-per-volt meter, as a milliammeter, low and high-range ohmmeter, a 1000 ohm-per-volt ac voltmeter, etc. With proper switching arrangements, all these features can be incorporated in one piece of equipment.

Multi-Ranger is available in 3½-, 4½- and 8½-in. sizes and each size is interchangeable electrically. Basic sensitivity of instrument is 400 microamperes and internal resistance is 500 ohms, plus or minus 1%. *Alnico* magnets are used, with the new Marion bulldozer moving system. Scales are printed in red, black and green for quick identification and cover a full 100 deg.

Scale ranges, as normally supplied, include: 0-10-50-250 dc v, 0-10-50-250 ac v, 0-500 ohms and —10 megohms, —10 to +14 db. By use of proper multiplier the 0-10 voltmeter scale may also be used as 0-1000 v.

Circuits supplied with each instrument provide clear instructions for construction of single or multi-range equipment; all component values are shown on circuits. **Dept P, Marion Electrical Instrument Co, Manchester, N. H.**

Lighting Capacitors

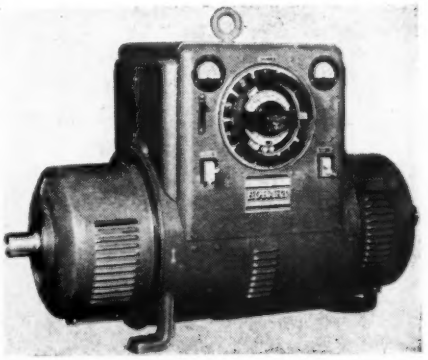
EXTRA RUGGEDNESS of fluorescent lighting capacitors has been attained, according to maker, first by a careful selection of tissue and foil, followed by thorough impregnation of sections using longer pumping cycles. The impregnant is *Hyvol*, a synthetic high-dielectric compound with stable characteristics. Aerovox fluorescent capacitors are now available in all standard designs, and also in special sizes and shapes, to suit any requirements. **Dept P, Aerovox Corp, New Bedford, Mass.**

Lubricant

I P LEADOLINE has high film strength Its high degree of adhesiveness enables it to adhere to metal surfaces, thoroughly wetting them and preventing creepage and wiping action under extremely high pressures. I P Leadolene repels water, according to manufacturer, is not easily emulsified and retains its stability in service and in storage. It is also said to lubricate successfully at low temperatures as well as high and will not fail when temperatures unexpectedly change. A neutral compound, it does not change to an acid or alkali under any conditions and does not attack metal. It protects against corrosion by air, water and many kinds of fumes. **Dept P, Brooks Oil Co, 315 E Carson St, Pittsburgh 19, Pa.**

Photoelectric Colorimeter

LUMETRON COLORIMETER Model 450 measures the light transmission of liquids in Nessler tubes. Light beam passes vertically through a long liquid column, making the instrument particularly suited for measurement of samples of pale color or faint turbidity. It furnishes high sensitivity in tests of this kind and permits operation with inexpensive Nessler tubes as sample holders. **Dept P, Photovolt Corp, 95 Madison Ave, New York 16, N. Y.**



Synchronous-Motor Welder

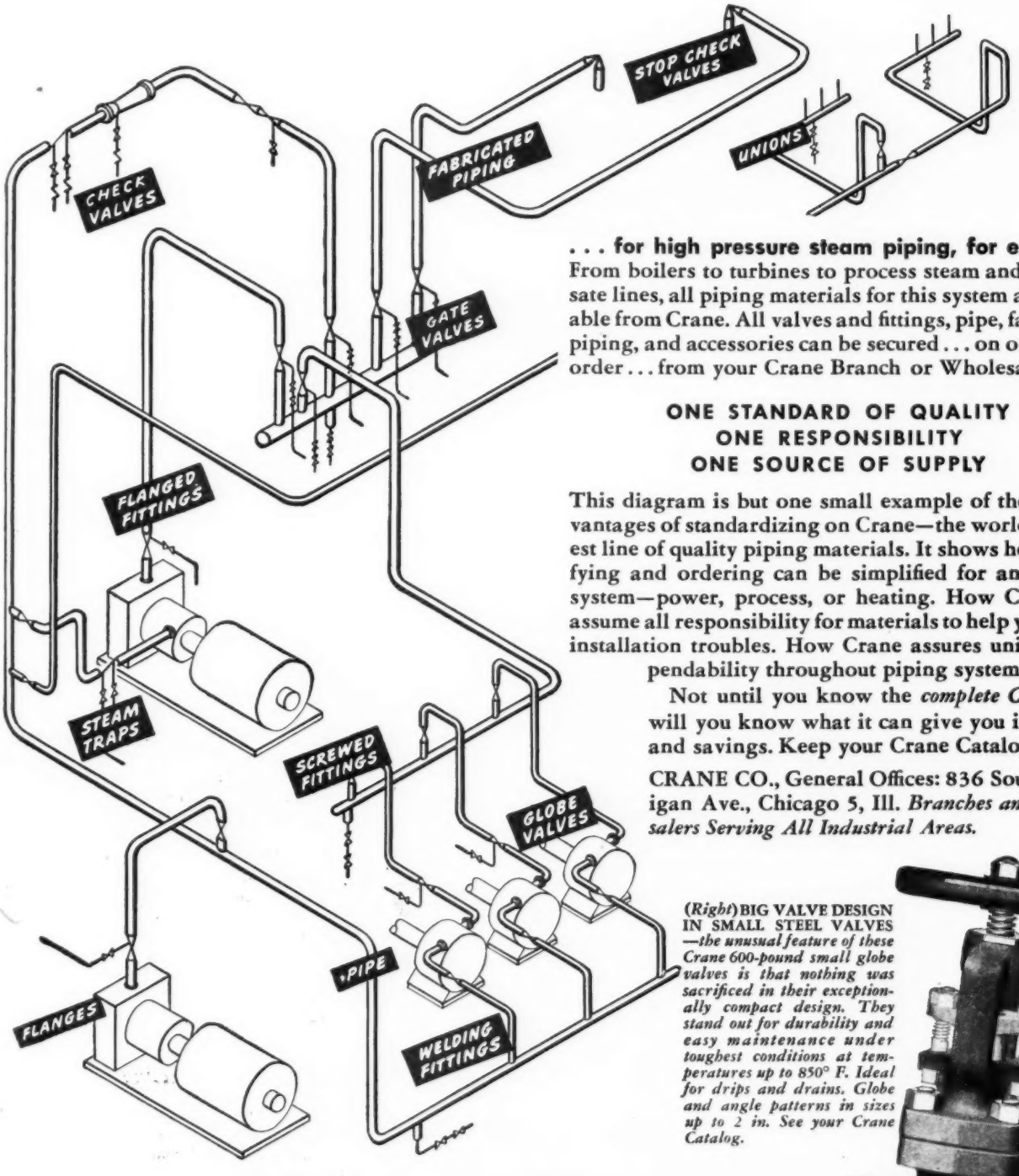
BY UTILIZING inbuilt separate exciter of Hobart electric-drive welder, company has produced a compact, high performance synchronous-motor welder. Unit is so proportioned that it can be started across the line, and automatically synchronize itself by the build of separate exciter. Starting current is about the same as a conventional induction motor of same hp capacity.

It is recommended that this unit be operated to draw leading current at no load to compensate for other low power-factor loads. Motor is a Hobart revolving-field synchronous design. It is furnished with heavy squirrel-cage winding to make easy starting as a conventional induction motor. Once

POWER brings this monthly survey of new equipment as one of its many reader services. In requesting additional information from manufacturers, please identify the source of your inquiry by referring to Dept. P

ONE ORDER TO CRANE . . .

Covers All Piping Materials



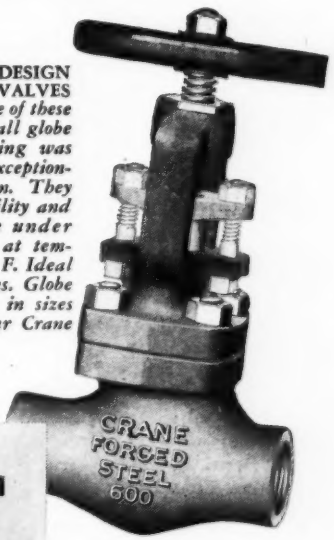
. . . for high pressure steam piping, for example. From boilers to turbines to process steam and condensate lines, all piping materials for this system are available from Crane. All valves and fittings, pipe, fabricated piping, and accessories can be secured . . . on one single order . . . from your Crane Branch or Wholesaler.

ONE STANDARD OF QUALITY
ONE RESPONSIBILITY
ONE SOURCE OF SUPPLY

This diagram is but one small example of the big advantages of standardizing on Crane—the world's greatest line of quality piping materials. It shows how specifying and ordering can be simplified for any piping system—power, process, or heating. How Crane can assume all responsibility for materials to help you avoid installation troubles. How Crane assures uniform dependability throughout piping systems.

Not until you know the *complete Crane line* will you know what it can give you in service and savings. Keep your Crane Catalog handy.

CRANE CO., General Offices: 836 South Michigan Ave., Chicago 5, Ill. *Branches and Wholesalers Serving All Industrial Areas.*



(*Right*) **BIG VALVE DESIGN IN SMALL STEEL VALVES** —*the unusual feature of these Crane 600-pound small globe valves is that nothing was sacrificed in their exceptionally compact design. They stand out for durability and easy maintenance under toughest conditions at temperatures up to 850° F. Ideal for drips and drains. Globe and angle patterns in sizes up to 2 in. See your Crane Catalog.*

EVERYTHING FROM . . .

CRANE

VALVES • FITTINGS
PIPE • PLUMBING
HEATING • PUMPS

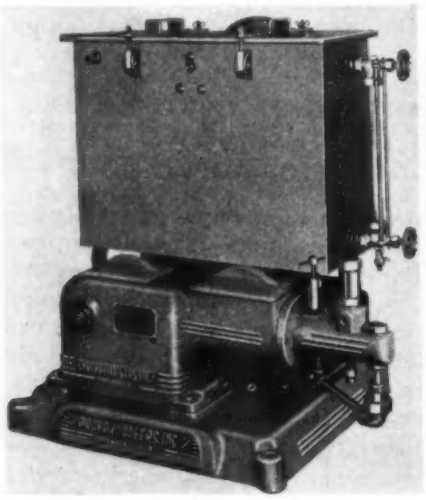
FOR EVERY PIPING SYSTEM

up to speed, exciter builds up and automatically applies correct excitation to motor fields.

This machine can also serve as an ac generator for operation of small tools, lathes, grinders, etc. This is done by coupling shaft to a gasoline or electric motor. **Dept P, Hobart Brothers Co, Hobart Sq, Troy, O.**

Hinged Gear Joint

THIS JOINT comprises alloy steel, heat-treated gears and a drop-forged housing. It operates smoothly in any position between 3 deg from a straight line to 139 deg. Unit is for manually operated remote controls. **Dept P, Gray & Prior Machine Co, 610 Windsor St, Hartford 5, Conn.**

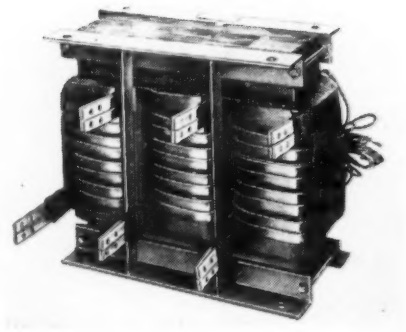


Water Treatment

PACKAGED UNIT for boiler-water treatment includes an *Adjust-O-Feeder* compactly mounted with a motor on same base with a chemical tank and agitator. It automatically feeds all treating chemicals and compounds. This packaged unit feeds chemicals for control of scale, pitting and corrosion. **Dept P, Proportioneers, Inc, 16 Codding St, Providence, R. I.**

Gas Analyzer

HAYS SERIES E ANALYZER tests high purity of oxygen, carbon dioxide and nitrogen in range from 90 to 100%. It is quite similar to standard orsat but its technique in operation differs somewhat. It is offered in two styles, a wall-mounted model for permanent installation and a portable model supplied in a metal case with leather-carrying handle. It also comes with a single unit or with two units. **Dept. P, Hays Corp, 905 8th St, Michigan City, Ind.**



Rectifier Transformers

IMPROVED DESIGN in this new line of Marcus transformers widens greatly, according to maker, its operating range. While its most important application is in field of electroplating rectifiers, it is also ideal for battery charging and other large rectifiers. Because of class of insulation used through the line, fiber-glass, mica, asbestos, etc, and Class C (bare copper) secondaries, it is claimed transformers withstand severe operating conditions with only air as cooling medium. Tapped primaries give a wide, flexible secondary voltage and current range. Multiple secondaries and other special variations can be had to meet individual requirements. Available sizes range from 500 va to 500 kva, single- and 3-phase, and in all standard frequencies. **Dept P, Marcus Transformer Co, 32 Montgomery St, Hillside 5, N. J.**

Nonmetallic Valve

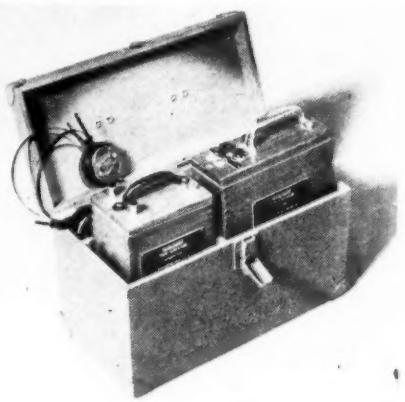
EMPLOYING A FLEXIBLE molded synthetic-rubber tube, incased within a bakelite body, the new Grove *Flex-tube* 3-way valve handles all fluids, including gases, chemicals and liquids. It is especially suited for hydraulic or pneumatic-cylinder operation. Because of its unrestricted straight-flow characteristic, this unit is most satisfactory for controlling viscous or solid-carrying fluids. Nonmetallic construction permits handling of highly corrosive or erosive liquids or gases. Manual

operation, by an over-center cam, opens and closes ports at each half turn of handwheel. Special self-locking feature assures positive, tight shutoff for extended periods of time.

Available in ⅛ and ¼ IPS, these valves are furnished for working pressures up to 250 psi and maximum temperatures of 150 F. **Dept P, Grove Regulator Co. 65th & Hollis St, Oakland 8, Calif.**

Air Filter

MADE OF GLASS FIBER, Badger replaceable air filter is said to provide greater filtering surface because of its rib design. Special flange construction makes a good air seal in frame. Although it is light in weight, great rigidity and sturdiness are assured by strong cardboard frame cemented to rib structure. **Dept P, Badger Corp, 341 E Brown St, Milwaukee, Wis.**



Pipe Locator

WAHLQUIST PIPE LOCATOR, Model 112, consists of transmitter and receiver units. Transmitter supplies a test signal to pipe or conduit and remains stationary. Receiver consists of an internal pickup coil and battery-operated 3-stage amplifier delivering its output into head phones. Pipe is traced by the signal picked up in its vicinity.

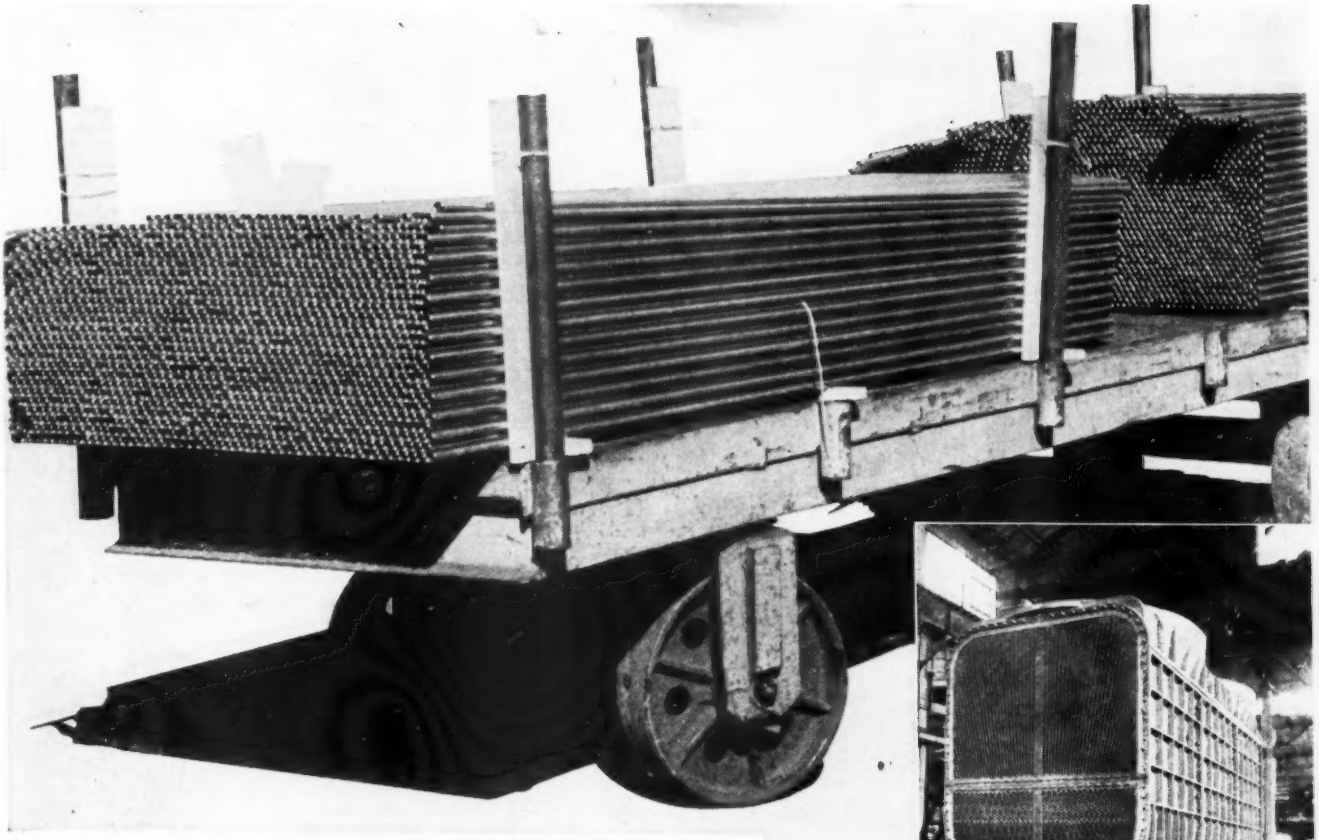
Units are in walnut cabinets with suitable carrying handles. In both units apparatus is fastened to top panel and can be conveniently withdrawn from case by removing two wood screws. **Dept P, Nilsson Electrical Laboratory, Inc, 103 Lafayette St, New York 13, N. Y.**

Thermal-Delay Relay

FOR CONTINUOUS OPERATION with its heater energized, Model 501 thermal relay combines both time delay and control functions in one unit with no danger of false operation caused by heat from the heater affecting the ambient-temperature compensation. Thus need for an auxiliary lock-in relay to cut

(*Continued on page 158*)

POWER brings this monthly survey of new equipment as one of its many reader services. In requesting additional information from manufacturers, please identify the source of your inquiry by referring to Dept. P



See REVERE

for Condenser Tubes and Plates

FOR many years Revere has been a prime source of supply for tubes and plates needed in the chemical, marine and power fields for condensers, heat exchangers, and similar uses.

Today, Revere once again is able to accept unrestricted orders.

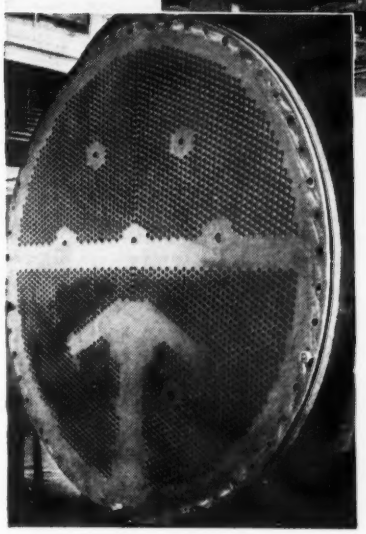
Plates are offered in the following: Muntz Metal, Naval Brass, Herculoy (silicon bronze), Cupro-Nickel, Admiralty Metal, Copper.

Tubes: Muntz Metal, Admiralty Metal, Copper, Revalon (aluminum brass), Cupro-Nickel, Herculoy, Brass.

Plates are offered in squares, rectangles, circles, half-circles, segments, and special patterns, up to 120 inches maximum dimension, finished weight about 11,000 lbs. maximum. These plates are flat, dense, free from blow holes and surface imperfections, accurate in gauge.

Revere tubes are available in all conventional sizes and gauges, and are made by the extrusion process, which produces dense, uniform and highly corrosion-resistant tubes.

Revere is glad to cooperate with you in determining the best alloy for any given conditions of use.



Easy machinability is one of the important features of Revere Condenser Tube Plates.

REVERE

COPPER AND BRASS INCORPORATED

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POWER NEWS

BUSINESS ITEMS AND APPOINTMENTS • WASHINGTON NOTES

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Bomb Test Will Be Vast Laboratory Experiment

▶ THE ATOMIC-BOMB TESTS in the Bikini Lagoon in July will be the greatest scientific experiment in history. Plans revealed by Rear Admiral W S Parsons, deputy task-force commander for technical direction, give first priority to data on the bomb itself, its release of energy in various forms, its thermodynamic efficiency, and the resulting variations of temperature and pressure with time, distance and level above and below water.

Second priority will go to determining what happens to all kinds of ships and equipment at all distances. Only a few of the target ships gathered in Bikini Lagoon will be sunk. In the rest the damage will be graded by distance from heavy to practically none.

Nine technical divisions, staffed by 1000 scientists and technical assistants, under Dr Ralph A Sawyer, technical director of "Operation Crossroads," will handle bomb operation, blast, pressure, shock, wave motion, oceanography, electromagnetic propagation, electronics, radiological safety, radiometry, radiation, remote measurements and technical photography.

Instruments used to measure pressure will include ball-crusher gages and aluminum-foil meters. The former measure pressure by deformation of a copper ball by a steel piston in a narrow cylinder. In the aluminum-foil meter rupture of the foil will show that pressure exceeds the set value of the gage. Other instruments will measure peak pressures and shock velocity.

Ship structures will be elaborately measured before and after the bomb to reveal deformations. They will also carry a great variety of measuring instruments, including strain gages.

Navy "drone" (pilotless, radio-controlled) planes will fly close to the blast equipped with recorders for velocity, gravity, time and altitude. Army aircraft drones will carry television transmitters, Foxboro recorders and Hathaway flight analyzers—all devices to report the effect of the detonation waves on the operating characteristics of aircraft.

Supersonic echo sounders will measure

(*Continued on page* 178)

COMING EVENTS

June 10-12—Semiannual meeting, Mount Royal Hotel, Montreal, Can. American Society of Heating & Ventilating Engineers, A V Hutchinson, secy, 51 Madison Ave, New York 10, N. Y.

June 12-16—18th National Oil & Gas Power Conference, Hotel Schroeder, Milwaukee, Wis. Oil & Gas Power Div, American Society of Mechanical Engineers, L N Rowley secy, c/o POWER, 330 W 42nd St, New York 18, N. Y.

June 14-15—Meeting, Hotel Carpenter, Manchester, N. H. New England States Assn of Power Engineers, Dudley G Kimball, chm, 55 Clifton St, Boston 25, Mass.

June 17-20—Semiannual meeting, Hotel Statler, Detroit. American Society of Mechanical Engineers, C E Davies, secy, 29 W 39th St, New York 18, N. Y.

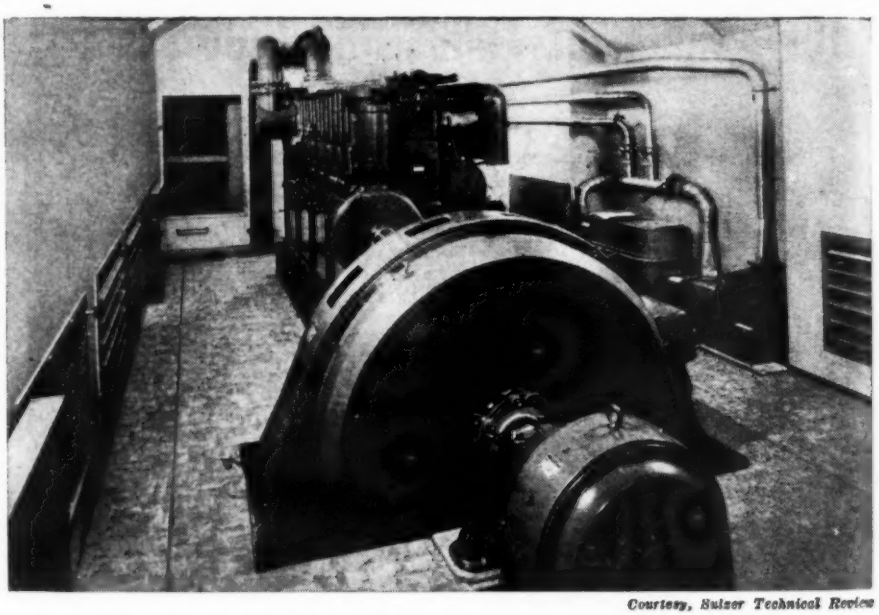
June 23-26—Meeting, Hotel Nicollet, Minneapolis, Minn. Smoke Prevention Assn of America, Frank A Chambers, secy, City Hall, Chicago, Ill.

June 24-28—Annual meeting, Hotel Statler, Buffalo, N. Y. American Society for Testing Materials, Robert J Painter, assistant secretary, 260 South Broad St, Philadelphia 2, Pa.

June 24-28—1946 summer convention, Statler Hotel, Detroit, Mich. American Institute of Electrical Engineers, A J Koetsier, chm, publicity comm, P O Box 828, Detroit 31, Mich.

Aug 19-23—National Power Show, Public Auditorium, Cleveland, O. National Assn of Power Engineers, A F Thompson, director of exhibits, 176 West Adams St, Chicago 3, Ill.

UNDERGROUND DIESEL BOASTS GAS MASK



Courtesy, Sulzer Technical Review

This remote-controlled 8-cylinder 4-stroke standard-design Sulzer engine, 450 hp at 500 rpm, was installed during the war at Schaffhausen, Switzerland, to supply city with drinking water and provide energy for sirens, air-raid shelters and hospitals during air bombardment or gas attack. Underground chamber is practically air-tight with provision for recirculating inclosed volume of air through heat exchangers supplied with water from Rhine. Engine air passes through a device for eliminating gas, which can be bypassed for normal operation. Gas cleaner shows at right of photo. Starting-air pressure is maintained by auxiliary motor-driven compressor. Remote indicators in main power station nearby tell operators whether the cooling-water system functions and engine is in starting position

GOOD CONTROL *pays off*—

. . . says M. H. Bischoff

Nalco Representative, The Flox Company
Minneapolis, Minnesota

Photo in Nalco Laboratories

Various scale conditions, created on test boiler tubes, which can all be corrected by Nalco Control.

GOOD control does not come in packages . . . but it is an integral part of the Nalco System of water treatment. Every plant where Nalco is in use has a routine control procedure, recommended as a result of a Nalco Engineer's survey of plant water and operating conditions. Nalco records show that the right chemical treatment, plus good control invariably pays off in lower fuel costs, longer on-line operation, and diminishing maintenance charges. Write today for details on getting complete scientific water treatment for your plant.

NATIONAL ALUMINATE CORPORATION
6222 West 66th Place, Chicago 38, Illinois

Canadian inquiries should be addressed to Aluminate Chemicals, Ltd., 555 Eastern Ave., Toronto, Ont.

Nalco
THE SCIENTIFIC WATER TREATMENT FOR ALL INDUSTRY

How to plan a

DIESEL ENGINE FUEL OIL SYSTEM

Another in the series of basic Piping Layouts prepared by Jenkins Bros.

Elimination of hazards of leaking oil is a requirement of all building codes and safety specifications for fuel oil installations. This layout illustrates a Deisel Engine Fuel Oil System which will be approved under practically all codes now in effect.

With no direct exposure of the large isolated storage tank in the engine room proper, the principal danger of oil leakage is removed. Oil is pumped from the main storage tank to the individual 50-gallon Day Tanks that are provided with overflows to return excess oil back to the storage tank in the event of overpumping. A pressure relief valve in the discharge line from the oil pumps returns the oil when excess pressure develops.

Anti-siphon valves prevent oil from being siphoned from the main storage tank through the lines and the Day Tanks, or directly from the Day Tanks, because of engine pull. These valves also check leakage, even in the event of a break in the oil feed lines to the engines. The remotely controlled solenoid valves, required by law, permit shutting down the engines from outside the engine room in case of fire. They are also often connected so that they shut down the engines whenever lubricating oil or water temperatures are too high or too low, or whenever water pressure is too low.

Control valves on each of the Day Tanks make it possible to fill them individually or in parallel. The duplicate fuel oil pump installation, one power driven, the other hand driven, assures uninterrupted operation. By-passes around the meters provide continuous operation should a meter fail. Positive shut-off of fuel to the engine is also provided at the engine itself for use when starting or shutting down.

Jenkins PRACTICAL PIPING LAYOUTS

Illustrating the proved 3-point formula for trouble-free, time-defying hookups

1. **Use the right type valve for the service.**
2. **Place valves correctly in the line.**
3. **Choose Jenkins Valves for lifetime economy.**

11

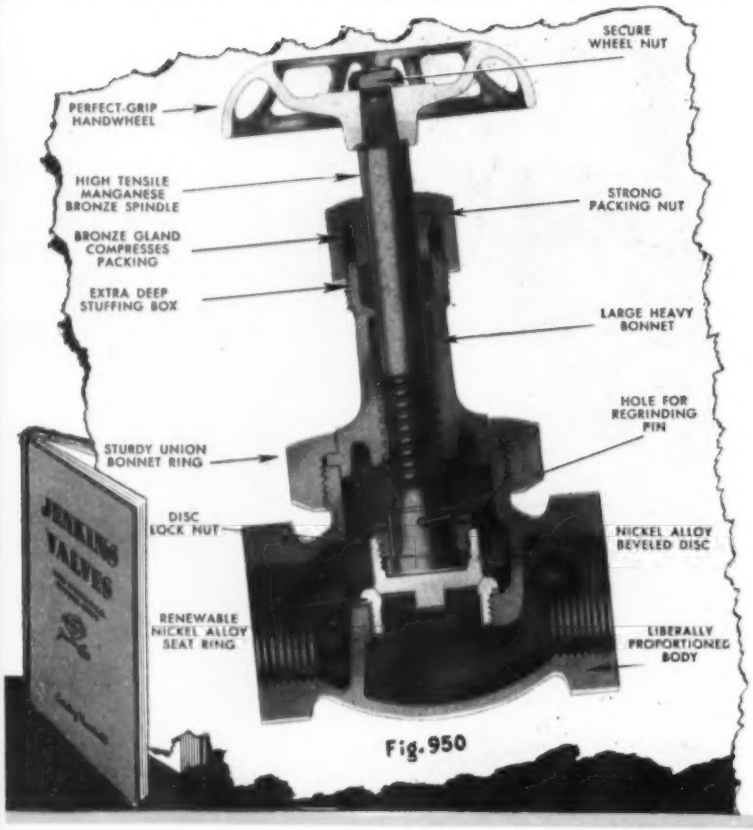


Fig. 950

Other types and pressure ranges of Jenkins Valves can be used for this type of layout, according to the factors involved. Consultation with accredited piping engineers and contractors is recommended when adapting these suggestions to your own requirements, or when planning any major piping installation.

Copies of Layout No. 11 will be furnished on request . . . also copies of future Piping Layouts. Just fill out and mail coupon.

Fig. 950, the Jenkins Regrind-Renew Bronze Globe Valve recommended in this layout, is a regrinding bevel seat ring and disc pattern, with union bonnet. Since the seat ring and disc can be reground without removing the valve from the line, maintenance is simplified. The design of the seating elements, an example of Jenkins *extra value*, permits repeated regrinding before renewal is necessary.

A CHOICE OF OVER 600 JENKINS VALVES

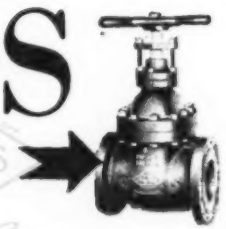
To save time, to simplify planning, to get the advantage of Jenkins specialized valve engineering experience, – select all the valves you need from the Jenkins line, described in the Jenkins Catalog, No. 76. It's your best assurance of *the lowest cost in the long run.*

Jenkins Bros., 80 White Street, New York 13; Bridgeport, Conn.; Atlanta, Boston, Philadelphia, Chicago, San Francisco. Jenkins Bros., Ltd., Montreal, London.

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864



125 TO 600 LBS. PRESSURE

Jenkins Bros

DIESEL ENGINE FUEL OIL SYSTEM

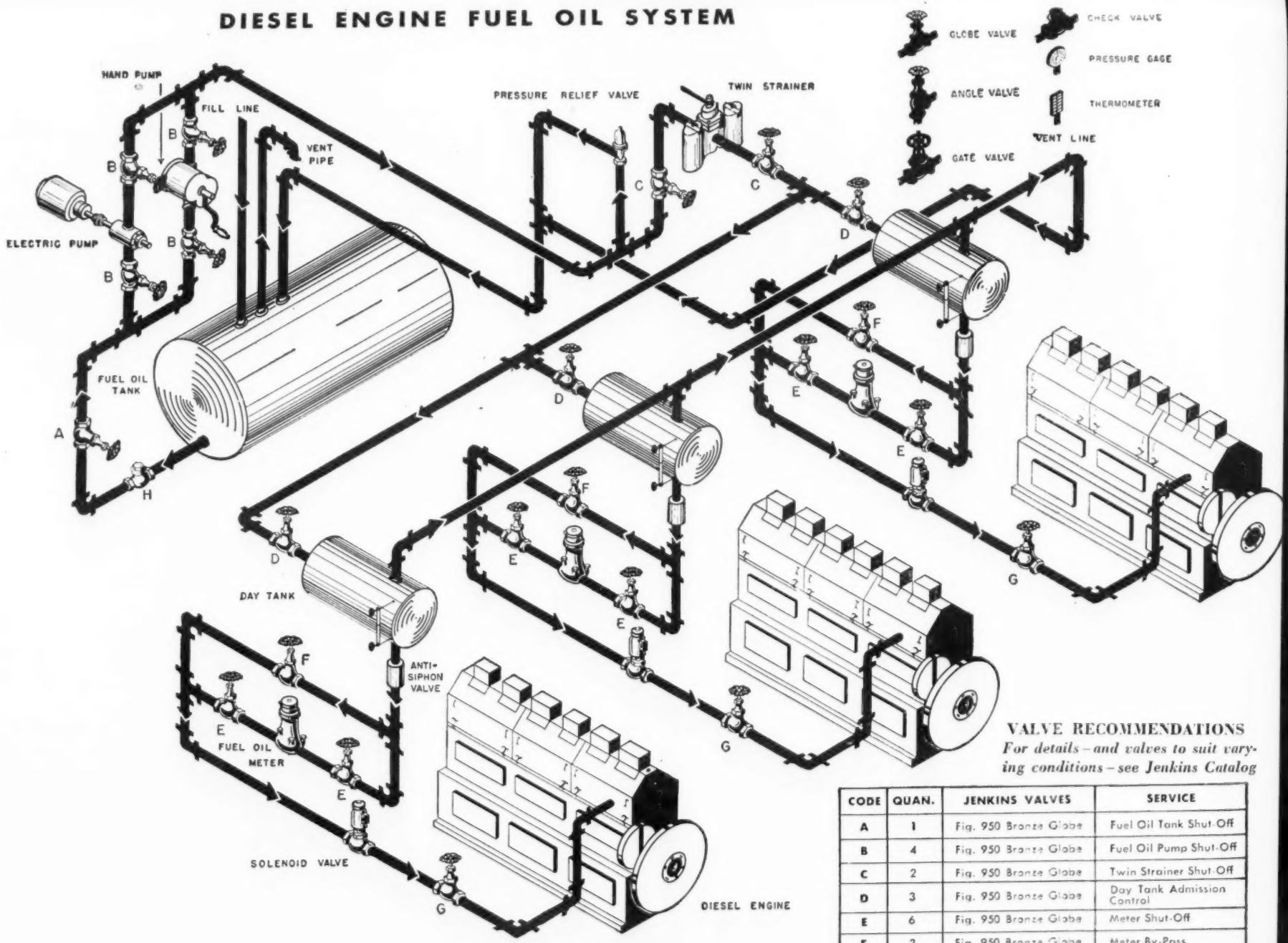


Diagram by Huxley Madeheim, Consulting Engineer.

VALVE RECOMMENDATIONS

For details – and valves to suit varying conditions – see Jenkins Catalog

CODE	QUAN.	JENKINS VALVES	SERVICE
A	1	Fig. 950 Bronze Globe	Fuel Oil Tank Shut-Off
B	4	Fig. 950 Bronze Globe	Fuel Oil Pump Shut-Off
C	2	Fig. 950 Bronze Globe	Twin Strainer Shut-Off
D	3	Fig. 950 Bronze Globe	Day Tank Admission Control
E	6	Fig. 950 Bronze Globe	Meter Shut-Off
F	3	Fig. 950 Bronze Globe	Meter By-Pass
G	3	Fig. 950 Bronze Globe	Engine Shut-Off
H	1	Fig. 762 Bronze Swing Check	Suction Line

BRONZE ★ IRON ★ STEEL

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Please send me a reprint of Piping Layout No. 11 and future Layouts as they become available.

Name .....

Company .....

Address .....

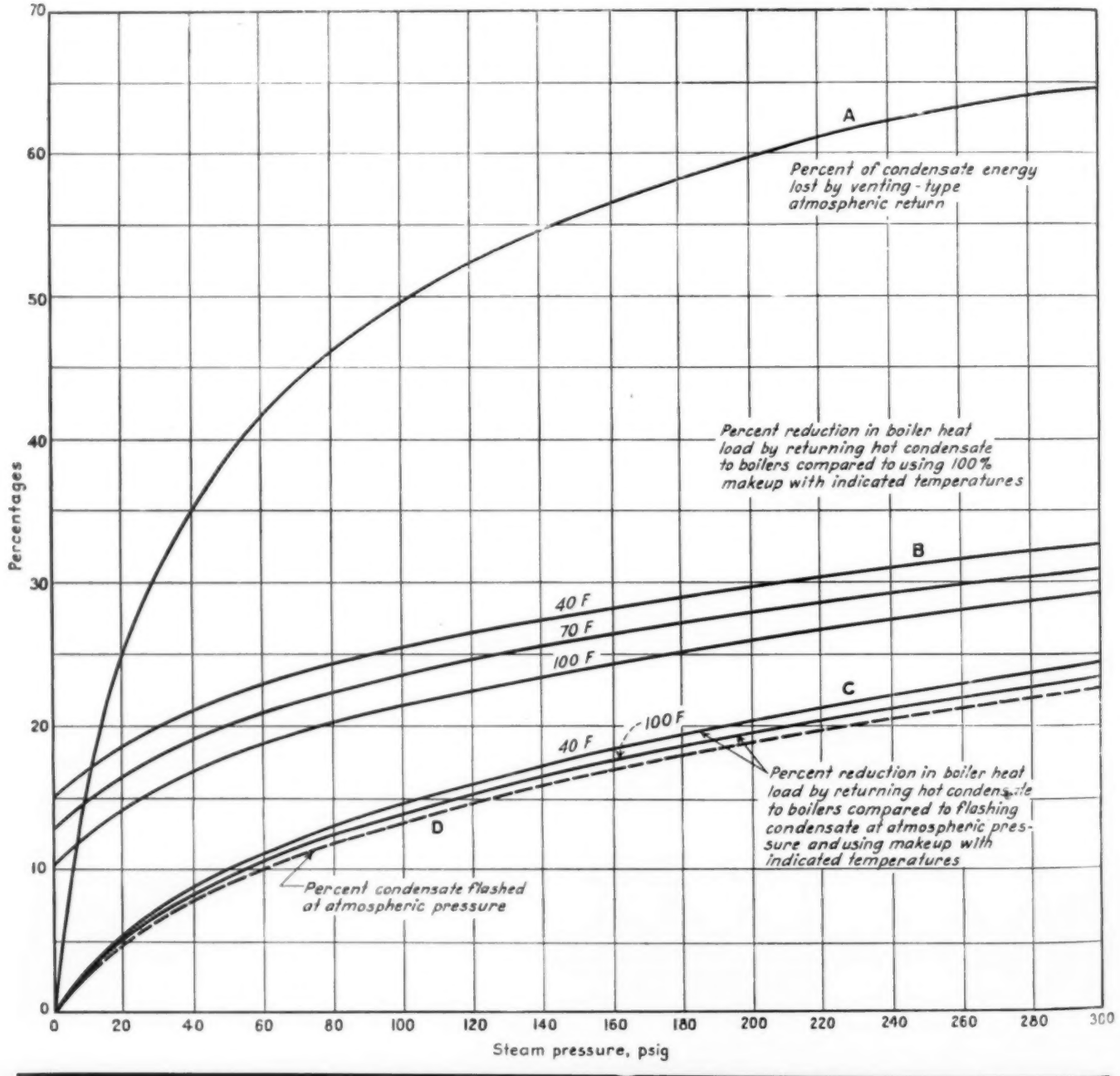
Number 166

High-Pressure Process-Steam Condensate

▶ ADVANTAGES of returning process-steam condensate to boiler without first throttling and venting flash steam to atmosphere are graphically shown in this chart. Besides saving valuable heat units hot-condensate return markedly reduces the boiler load and releases capacity for additional uses, especially at the higher steam pressures.

Curve *D* shows the proportion of condensate flashed to steam when throttled to atmospheric pressure. If the flashed steam cannot be utilized this steam is wasted and the proportion of energy lost is indicated by curve *A*. The practical effect of such throttling and wasted flash steam is given by the curves *C*, showing the increase in boiler load caused by replacing the lost flashed steam with makeup at temperatures of 40 and 100 F and assuming the remaining condensate is returned at 212 F.

The curve family *B* on the chart compares the reduction in the boiler load effected by returning the hot condensate under pressure with wasting all of the condensate and replacing it with raw makeup to the boiler at inlet temperatures of 40, 70 and 100 F. *Courtesy of* ***David Stout & Sons, St. Louis, Mo.***



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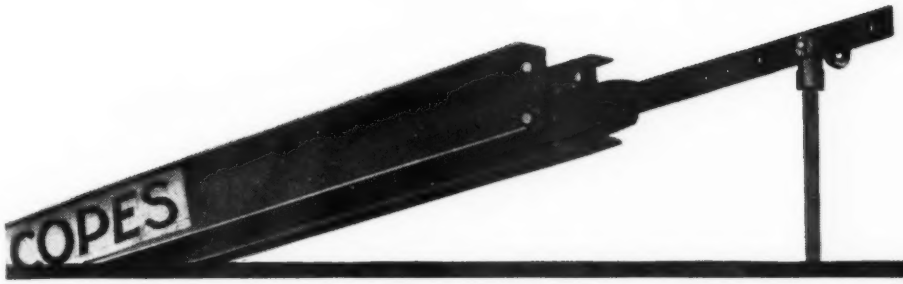


237,263,950
pounds per hour

COPES Flowmatic has now been ordered for a combined boiler capacity in excess of 237 million pounds of steam per hour. For 32 makes of boilers, at pressures up to 1825 psi, with evaporation up to 650,000 pounds an hour. For units fired by pulverized coal, stokers, gas, oil, acid sludge, or black liquor; for waste-heat and "cat cracker" installations. For plants in 43 states, two territories and 21 other countries. Four out of ten orders received have been "repeats."

No other multiple-element feed water regulator has had so wide a range of operating experience. No other regulator of the steam-flow type has proved so easy to keep in dependably accurate operation.

If you would like to know where to check on results with COPES Flowmatic, write for the bulletin — "455 Users." If you want thoroughly modern feed water control for your plant, outline your operating conditions in detail when you write.

NORTHERN EQUIPMENT COMPANY

661 Grove Drive, Erie, Pennsylvania

Feed Water Regulators, Pump Governors, Differential Valves, Liquid Level Controls, Reducing Valves and Desuperheaters

BRANCH PLANTS: Canada, England, France.

Representatives Everywhere

★ **GET CLOSER LEVEL CONTROL WITH THE** COPES FEEDS BOILER ACCORDING TO STEAM FLOW-AUTOMATICALLY **FLOWMATIC** ★ REGULATOR

Don't Believe All You Hear . . .

I've just finished reading a book called "The Natural History of Nonsense," in which author Bergen Evans points out some of the misconceptions that plague the popular fancy today.

All of us have heard, at one time or another, of "authenticated" cases of fish being rained from the heavens. As recently as 1931, one newspaper described a rain of perch at Bordeaux, France, so heavy that motor cars were compelled to halt. And there's the familiar yarn about the curse of the ancient Egyptian King Tutankhamen.

These myths are more amusing than believable to most people, but their very persistence in human history accounts for the development of more modern and more harmful tales. For example, there is the assertion often used that if bathtubs are put in the homes of the poor, they will only dump coal in them. (The users of this proposition neglect the fact that most housing projects are centrally heated, hence the occupants would be put to a lot of hard work and inconvenience to carry coal upstairs.)

A more recent and loathsome case came to light during the war. An outfit sold nearly 500,000 copies of a steel-jacketed Bible, at a fancy price, to the relatives of servicemen on the basis that these volumes "were capable of deflecting bullets." The Federal Trade Commission caught up with the scheme, charging the perpetrators with getting money under false pretenses.

We've all seen the same sort of misconceptions peddled in our own plants—ranging from compounds guaranteed to raise boiler efficiency 100% to inventors selling stock in perpetual-motion machines. The instigators of such ideas love to use catchwords and irrelevant testimonials, and to recall the scorn heaped on the heads of former scientists. "Remember how people laughed at Edison when he tried to light New York with electricity," they say as a plea is made to get you to use a patented liquid claimed to cut fuel consumption in half. Maybe they can do that—and, sometimes, just by cleaning out the boiler tubes—but the lack of confidence in Edison has no bearing on it.

It can't do much harm, I'll agree, to believe that all Orientals have slanting eyes, or that a stock market crash can turn your hair white overnight, but it is extremely dangerous to form a technical opinion without evidence. As engineers, we owe it to ourselves and our communities to be unusually circumspect in accepting claims, and to investigate, test, analyze and check results. And for what we don't know personally, remember that "knowledge is within the reach of all who seek it."

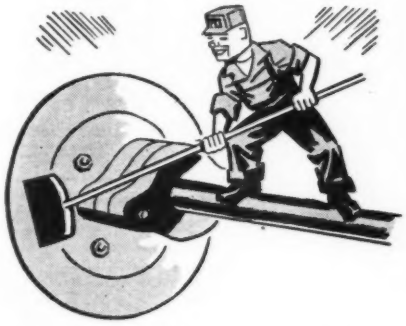
George Edwards
Engineer

The Stuffing Box

TIPS ON GOOD PACKING PRACTICE

NO. 2 OF A SERIES

The first step to getting the most out of packing is correct installation. Here are a few good packing practices:

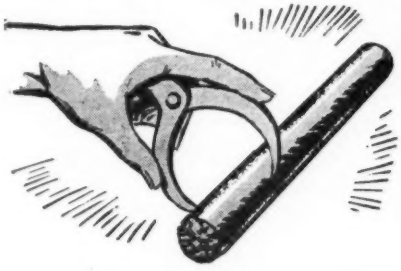


Old and new packing don't mix . . . so **First,** clean the box thoroughly by removing all the old packing, including the accumulation from the walls.

Second, be sure to keep the packing clean during application. Many rods, shafts, sleeves, etc., are scored by grit or other foreign matter picked up by the packing before installation.

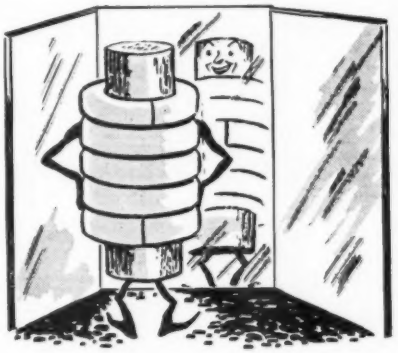
Third, of course, use all new packing when renewing. Worn packings are dry, highly compressed, have high friction and may score. Packing is much cheaper than new shafts, sleeves and rods.

How do you decide what size packing you need? The quickest and surest way is to check the diameter of rod or shaft and the inside diameter of the stuffing

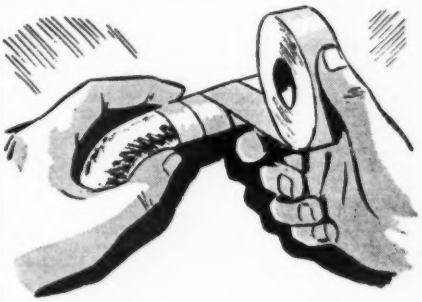


box, and choose correct size packing to fit. In this way the packing will compensate for any wear on the rod.

To get close-fitting rings . . . and save time . . . the packing should be tightly spiraled in a very close spiral directly on a rod or mandrel of the same diameter as the one on which the packing is to be used. Then place a straightedge across the packing parallel to the axis of the rod, and carefully mark or scribe the packing. The packing may then be removed from the rod or mandrel and cut on a flat surface at the places marked.



When rings are cut from soft coil stock, the ends may tend to squash or become ragged. By simply applying a small piece of friction tape around the section where the packing is to be cut, you can obtain sharp, clean cuts. Then remove the tape when installing the rings. String also



serves well for tying the packing on each side of where the cut is to be made.

And a don't: never wind a length of packing into a stuffing box . . . cut the packing into individual rings first.

When you need a packing—there are 400 conveniently located Johns-Manville Distributors ready to supply you with the right one for your job.

a tip on a good packing . . .

JOHNS-MANVILLE MOGUL PACKING

For general utility service, choose Mogul Rod and Valve Stem Packing. Unusually adaptable, it remains permanently soft and resilient when subjected to the sustained heat of the stuffing box. J-M Mogul assures long, economical service when used on valve stems and reciprocating rods with small packing spaces . . . against air, water, ammonia, oil, chemicals and other conditions where a soft, pliable packing without rubber is needed. See your distributor, write Johns-Manville, Box 290, New York 16, N. Y.

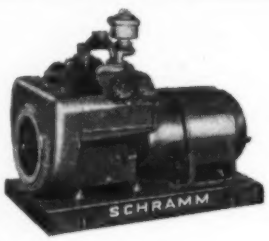
There's a

SCHRAMM

AIR COMPRESSOR

. . . for your every need!

SIZES RANGING FROM 2 TO 600 CU. FT. DISPLACEMENT

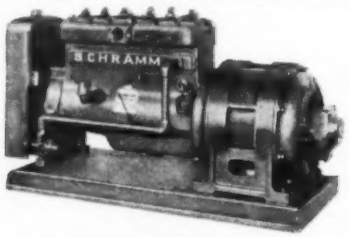


DIRECT DRIVE ON BASE

Built-in Motor Drive mounted on steel base is compact and easy to install. No foundations necessary.

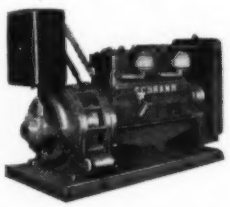
WITH "V" GROOVE PULLEY

Schramm Belt Driven Compressors can be obtained with "V" or flat belt drive suitable for twenty-four hour service and economical operation.



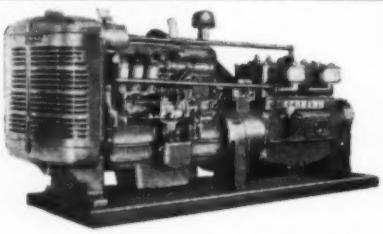
DIRECT MOTOR DRIVE WITH COOLING UNIT

Schramm 300 cu. ft. displacement with direct-connected 50 H.P. motor with cooling unit on Steel Deck Base.



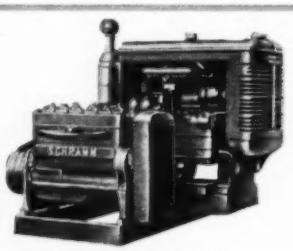
DIRECT DRIVE WITH STARTER AND RADIATOR

Both compressor and motor are mounted as a single unit on a substantial steel base with starter, radiator, and cooling unit.



DIESEL ENGINE DRIVE-IN LINE

Complete self-aligned, direct connected Diesel Engine Driven Compressor for semi-portable or stationary installation.



BELT DRIVE ON BASE WITH ENGINE

Schramm Engine Belt Drive on Base combinations are available for applications not reached by electric power service in mill, mine, and other industrial plants.

SCHRAMM INC. COMPRESSOR SPECIALISTS WEST CHESTER PENNSYLVANIA

Pump Q & A

(*Continued from page* 120)

hydraulic-thrust balancing device correct the efficiency by the formula:

$$\text{Corrected eff} = \text{pump eff} \times \frac{Q + Qd}{Q}$$

where Q equals pump discharge, and Qd flow through the thrust-balancing device's leakoff.

Q 10—*Is there a quick rule for determining minimum permissible capacity of a boiler-feed pump and, thus, the necessary bypass?*

A—To limit the temperature rise in a boiler-feed pump to 15 F do not reduce its capacity below 30 gpm for each 100-hp input to the pump at shutoff.

Q 11—*How is a pump protected against overheating because of operation at shutoff?*

A—Protection is given by installing a bypass in the discharge line between the pump and shutoff valve, Fig. 2. Connect the bypass to a part of the system where pressure is lower than discharge and where heat absorbed during low-flow operation can be dissipated.

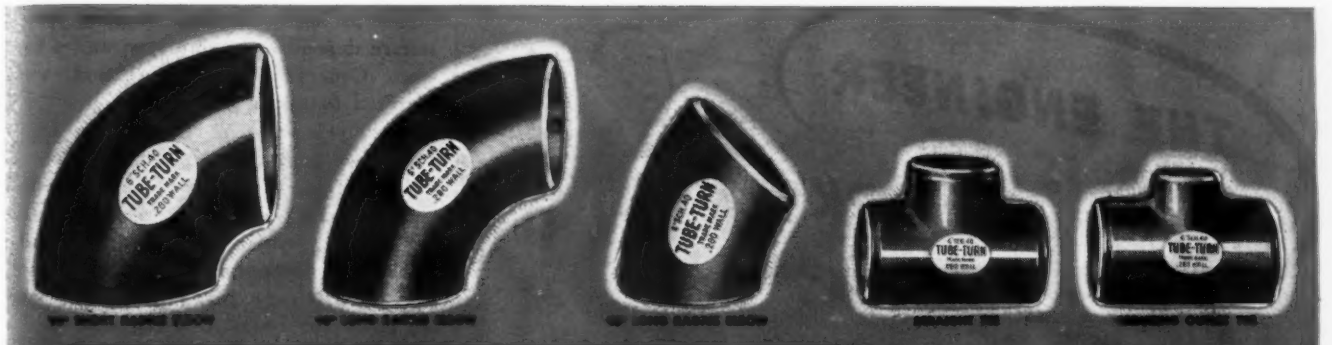
Q 12—*How should a motor-driven pump be started?*

A—This depends upon pump size and operating conditions. Many installations require steps which are unnecessary in others. Assuming a pump, arranged as in Fig. 2, which is to be started against a closed gate valve; starting procedure is as follows:

(1) Prime the pump, after opening suction gate valves and closing drains to prepare it for operation. (2) Open valve in cooling-water supply for bearings. (3) Open valve in cooling-water supply for watercooled stuffing boxes. (4) Open valve in sealing-liquid supply. (5) Open warm-up valve if pump is not kept at temperature. When pump is warmed up close valve. (6) Open valve in the recirculating line. (7) Start motor. (8) Open discharge gate slowly. (9) Observe leakage from stuffing boxes and adjust sealing liquid valves for proper flow to insure packing lubrication. (10) Check mechanical operation of pump and motor. (11) Close valve in recirculating line if there is sufficient flow through pump to prevent overheating.

If the unit is started against a check valve with the discharge gate valve open, starting procedure is the same as outlined except that the discharge gate valve is open some time before the motor starts.

Q 13—*How should a motor-driven pump be stopped?*



TUBE-TURN

TRADE MARK

WELDING FITTINGS AND FLANGES

TUBE-TURN WELDING FITTINGS—RANGE OF SIZES

Type of Fitting	Description	Standard Weight	Extra Strong	Schedule 160	Double Extra Strong	Light Gauge	
						Nominal Pipe Size	Iron Pipe Size
Elbows	90° Long Radius	½"-24"	½"-24"	1"-12"	¾"-8"	4"-24"	3"-12"
Elbows	90° Short Radius	1"-30"	1½"-30"				
Elbows	45° Long Radius	½"-30"*	½"-30"*	1"-12"	¾"-8"	4"-24"	3"-12"
Returns	180° Long Radius	½"-24"	½"-24"	1"-12"	3"-8"	4"-24"	3"-12"
Returns	180° Short Radius	1"-30"	1½"-30"				
Returns	180° Extra Long Radius	1"-2½"	1"-2½"				
Tees	Straight	½"-24"	½"-24"	½"-12"	½"-8"		
Tees	Reducing Outlet	½"-24"	½"-24"	½"-12"	½"-8"		
Reducers	Concentric & Eccentric	1x¾-24x20	1x¾-24x20		1x¾-8"x6"		
Caps		1"-24"	1"-24"		1"-8"		
Stub Ends	Lap Joint	1"-24"	1"-24"				
Nipples	Shaped, 90° to Header	1¼"-12"	1¼"-12"				
Nipples	Shaped, 45° to Header	1¼"-12"	1¼"-12"				
Saddles		2"-24"**					
Laterals	Straight	1¼"-24"	1¼"-24"				
Laterals	Reducing-on-Run	1¼"-24"	1¼"-24"				
Crosses	Straight	¾"-24"	¾"-24"				
Rings	Welding	¾"-12"	¾"-12"				
Sleeves	Welding	2"-24"**					

SUPER Tube-Turn 45° long radius elbows, 90° long radius elbows, and 180° long radius returns available in both Standard weight and Extra Strong in sizes from 3" to 12".

Tube-Turn welding fittings and flanges conform to applicable ASA and ASTM Standards. For further details please refer to Tube Turns catalog and data book No. 111.

*30" size short radius

**Since saddles and sleeves are used for external reinforcement only, they do not conform to iron pipe size thicknesses.

TUBE-TURN FORGED STEEL FLANGES—RANGE OF SIZES

	150 Lb.	300 Lb.	400 Lb.	600 Lb.	900 Lb.	1500 Lb.	2500 Lb.
Welding Neck	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Slip-on	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Lap Joint	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Threaded	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Blind	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Socket Type	¼"-24"	¼"- 4"		¼"-3½"			
Reducing-threaded or slip-on	¾"-24"	¾"-24"	¾"-24"†	¾"-24"	¾"-24"*	¾"-24"	¾"-12"
Orifice—threaded		1"-24"	4"-12"	4"-12"	3"-12"	1"-12"	
Orifice—slip-on		1"-24"					
Orifice—welding neck		1"-24"	4"-12"	1"-12"	3"-12"	1"-12"	
Long Welding Neck	1"-24"	1"-24"	1"-24"	1"-24"	1"-24"	1"-24"	1"-12"

†Dimensions on sizes thru 3½" same as for 600 lb. flanges.
*Dimensions on sizes thru 2½" same as for 1500 lb. flanges.

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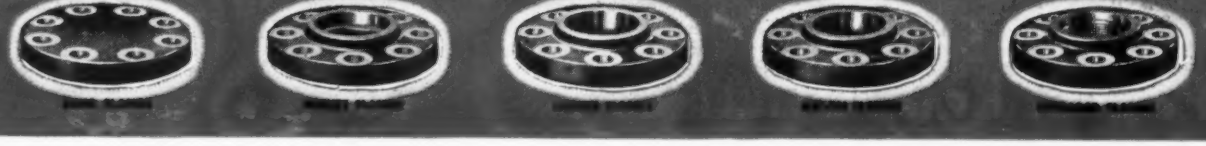

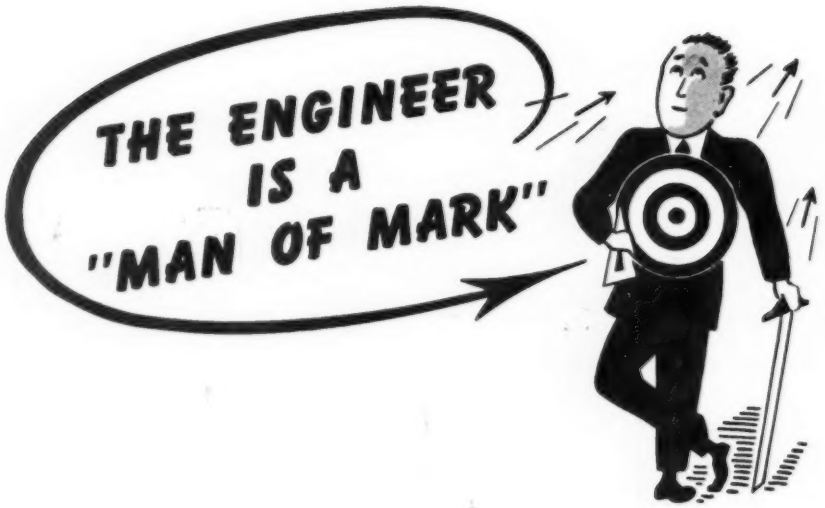

Why, then, is his mark so often missed? Because it is not unlikely for Management to become so enmeshed in reconversion, distribution and sales problems, that it can fail to see clearly how easily the Engineer's abilities can be translated into actual profits.

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PREFERRED UTILITIES

A—Just as in starting, stopping procedure depends on pump type and service. Generally, the steps that are required to stop a unit are:

(1) Open valve in recirculating line. (2) Close gate valve. (3) Stop motor. (4) Open warm-up valve if pump is to be kept warm. (5) Close valves in sealing-liquid, bearing-cooling-water, and stuffing-box cooling-water lines. (6) Close suction valve, open drain valves, etc, as the particular installation requires.

When the pump does not permit operation against a closed gate valve, steps 2 and 3 are reversed. Many installations permit stopping the motor before closing the discharge gate valve. Sometimes, requirements of a particular case make necessary (1) additional starting and stopping steps or (2) a change in their sequence.

Q 14—How should a steam-turbine-driven pump be started?

A—In general, starting and stopping a steam-turbine-driven pump requires the same steps and sequence as a motor-driven pump. Steam turbines usually have drains and seals that must be opened and closed before and after operation. Likewise, most turbines require warming up before starting; therefore follow the turbine manufacturer's instructions. This also holds for internal-combustion-engine drives.

Q 15—Can a centrifugal and a reciprocating pump operate in parallel?

A—Generally they can, but centrifugal-pump performance is affected by reciprocating-pump pulsations. A triplex pump has the least effect on centrifugal-pump operation while a single-acting single-cylinder pump might cause trouble. Do not use a common suction line for a centrifugal and a reciprocating pump, especially if the suction lift is high.

Q 16—What observation should be made of pump operations?

A—In a station where operators are on constant duty, make hourly and daily inspections for irregularities in operation. Investigate immediately change in a running pump's sound. Observe hourly bearing temperatures and stuffing-box operations. In ring-oiled bearings see that the rings function properly. See that stuffing-box leakage provides cooling and lubrication of the packing but is not excessive and wasteful. Check pressure gages and flow indicator hourly, if they are installed, to see whether pressure and flow correspond to operating conditions. If recording instruments are available, check these daily to insure that output, pressure or power consumption indicate correct performance.

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Engineer's Bookself

(*Continued from page* 126)

Part II on Nonmetallic Materials (constructional), 250 pp, has 50 standards. Subjects include lime, filter block, glass, soils (5); refractories, fire brick (14); thermal insulating materials (11); roofing materials, wood (3); paint, varnish, lacquer, etc (16); naval stores (4); thermometers.

Part III on Nonmetallic Materials (general), the largest volume, 500 pp, over 95 standards. Specifications and tests cover: coal, thermometers (2); petroleum products and lubricants (10); electrical insulating materials (12); plastics (15); rubber products (4); shipping containers (2); textile materials (11); paper and paper products (12); soaps and other detergents (6); naval stores (4); water for industrial uses (4); industrial aromatic hydrocarbon (19).

HIGH VACUUM TECHNIQUE (*second edition revised*—1945) *By J Yarwood, lecturer in physics, South-East Essex Technical College. Dagenham, England.* 140 *pp*, 5¾ x 9, 90 *illust, numerous tables, cloth* $2.75. *John Wiley & Sons, Inc*, 440 *Fourth Ave, New York* 16, *N. Y.*

Introducing the latest developments in high-vacuum apparatus this book describes important industrial processes and compiles the many facts regarding the properties and uses of materials encountered in all types of vacuum work. New sections added cover the performance of vacuum pumps, construction of vacuum systems and instruments for measuring low pressures. A bibliography lists important papers that have been published on the subject.

Starting with a chapter describing the many different pumps used for evacuating purposes, the author follows through by discussing measuring instruments, degassing operations, the application of high vacuum to industry, and the properties of materials important in high-vacuum technique.

BUILDING AN ENGINEERING CAREER (*second edition*, 1946) *By Clement C Williams, consultant, engineering and industrial education, formerly president of Lehigh Univ.* 309 *pp*, 5½x8½, *illust, cloth* $2.50. *McGraw-Hill Book Co., New York* 9, *N. Y.*

With the flood of applicants, GI's and others, seeking admittance to the country's universities and colleges, release of this book proves most timely to those seriously choosing a career. The fact that it is a second edition enhances its value in that its material content is time-tested, improved where needed, and revised to fit present-day views.

In his opening chapter the author establishes his method of treatment by (1) defining the descriptive terms he employs (2) presenting in chart and table the numerical distribution within the professions (3) grouping professional occupations in dictionary style and (4) discussing aptitudes, interests and their application to a career.

From this point follow a presentation of the profession of engineering, its origin, its demands upon its members, its branches,

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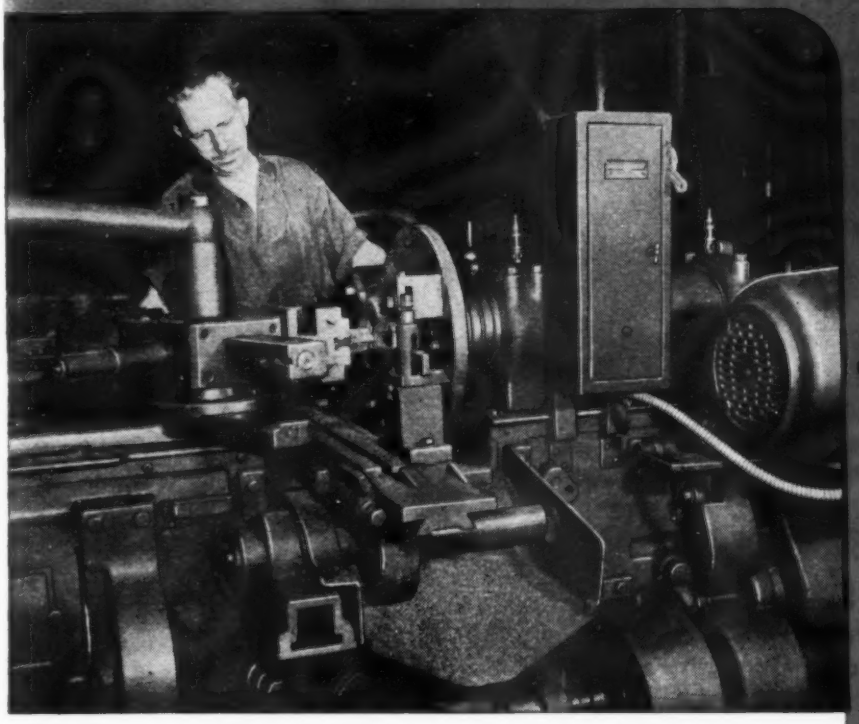

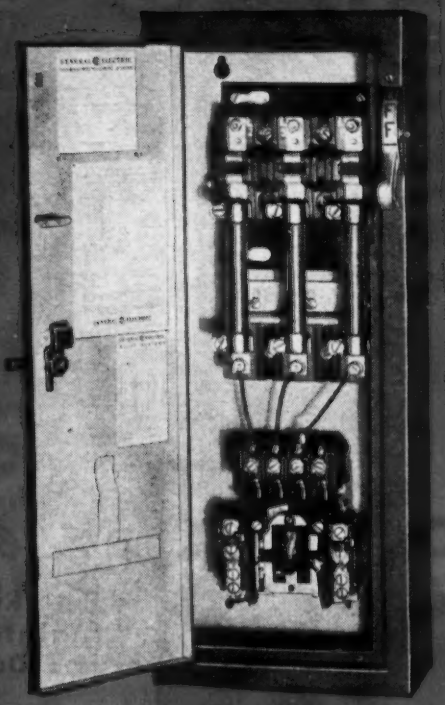

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earning power and lastly its growing social imports, licensing and ethics. Chapters covering objectives of engineering education, and study suggestions complete the first part.

Second and third parts discuss the specific major engineering branches and achievements within each. An appendix lists visual aids, motion pictures and film strips that cover material of interest to these engineering groups.

GRINDING WHEELS AND THEIR USES—*(second edition 1943) By Johnson Heywood, under the auspices of The Grinding Wheel Manufacturers Association.* 436 *pp,* 436 *illust,* 5¾x9, *cloth* $3.00. *The Penton Publishing Co, Cleveland, Ohio.*

The first edition of this book was published in 1938 to give a complete description of grinding practice at that time. Improvements in grinding machines and wheels came so rapidly that the book was revised to help the preparedness program.

Considerable emphasis has been put on typical ingenious ways to solve difficult grinding problems and the book is a clearing house of information to which shop men have contributed not only their practical and theoretical knowledge, but also various grinding practices and methods they found best.

The book goes to considerable length in describing abrasive material, how grinding wheels are made, the theory of grinding, how to select the right wheel for the job, how to perform grinding operations, and many other subjects too numerous to describe. A valuable guide and reference book for anyone responsible for grinding-wheel applications.

MECHANICAL PACKINGS MANUAL (1945) 336 *pp,* 6x9, 212 *illust,* 43 *tables, genuine leather.* $4.50. *Graton & Knight Co,* 356 *Franklin St, Worcester* 4, *Mass.*

Too much emphasis cannot be placed on good packings and their correct applications. Unfortunately this has not been the attitude of many engineers and machine designers toward the material on which depends the successful operation of so many machines. Probably for this reason so little attention has been given to packing problems in engineering literature. Of the few books published on packings, this one is worthy of first place.

It presents the basic principles and requirements for intelligent application of leather and synthetic-rubber mechanical packings. Regardless of how complex the problem these basic principles of material, design, application and maintenance must be observed to insure long packing life and trouble-free performance.

The 14 chapters cover: origin and principles of hydraulic and pneumatic machines; summary of packing materials; basic packings types and fundamentals of their applications; design and application of leather packings and accessories; synthetic-rubber packings; selection of packings; how to order packings; care, maintenance, installation of packings, and common causes of their premature failures; causes of corrosion of machine parts adjacent to packings: oil seals; selecting a packing source; definition of words and terms, bibliography of published literature, and related technical data. Several folded-in inserts give synthetic-rubber V-

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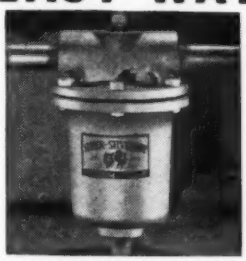

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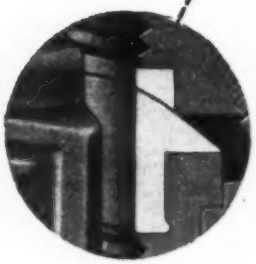

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packings dimensions; current accepted methods and standards for operating O-ring applications; four methods for packing gland recesses; four methods for packing piston heads; and two methods of packing an inside-cylinder recess.

The authors have drawn on the company's wealth of practical material accumulated by its engineers and research laboratories in solving thousands of industrial-packing problems. The highly practical presentation makes the book a useful tool to everyone interested in mechanical-packing problems, mechanic, engineer, instructor or student.

FLOW-METER ENGINEERING HANDBOOK (*second edition*, 1946). *Compiled and edited by Louis Gess and R D Irwin, flowmetering department, Brown Instrument Co.* 151 *pp*, 8x10½, 49 *illust*, 55 *tables, fabroid.* $2.50. *Brown Instrument Co*, 4490 *Wayne Ave, Philadelphia* 44, *Pa.*

Meters perform indispensable functions in power- and industrial-plant operations. They are essential to efficient and intelligent handling of plant equipment and many industrial processes would be impossible without suitable metering equipment. This handbook has been compiled with the importance of the metering job in mind. The first edition was prepared as a comprehensive guide to the selection and application of flowmeters. In the second edition, the expanded material includes suggestions by readers to improve the usefulness of the first edition.

The 16 chapters treat such subjects as principles of orifice-meter measurements; orifice-plate and differential connections; flow-approximation tables; viscosity of fluids; orifice calculations for steam, water, oil and gas flow; correction for changes in operating condition in steam, water, oil and gas flow; and volume computations. The latter include orifice coefficients for vena-contracta taps in 2- to 12-in. pipe.

Where possible, the authors have used the symbols for fluid measurements as in the ASME publication, *Fluid Meters, Their Theory and Application*. Derivations of formulas include those for a universal one for fluid measurements with thin-plate orifices, practical working equations and the use of Reynolds' Numbers. Included are recommendations of the Joint AGA and ASME Engineers' Committee on Fluid Measurements for Orifice Installations.

PROCEEDINGS: SMOKE PREVENTION ASSN OF AMERICA, INC (1945) 105 *pp*, 10¾x8½, *illust, paper*, $2. *Smoke Prevention Assn of America, Inc, Chicago, Ill.*

This single volume contains the papers and accompanying illustrations presented at the 1945 conference of the sponsoring organization in Columbus, Ohio. The collection of papers, together with the discussion they prompted from individuals and organizations most interested, aids greatly in presenting the latest thoughts on a problem of vital public interest, smoke and its prevention.

Scope and progress of this subject is evidenced by various highly individualistic solutions such as establishing a central steam supply or continuing a government-sponsored volunteer field organization of combustion-efficiency experts, presented along with reports on developments of smokeless fuel by

No Plant Operator Can Afford

OBSOLETE POWER TRANSMISSION EQUIPMENT

Whether you generate your own power or buy it from an outside source, you cannot afford to waste it; therefore you cannot afford obsolete power transmission equipment.

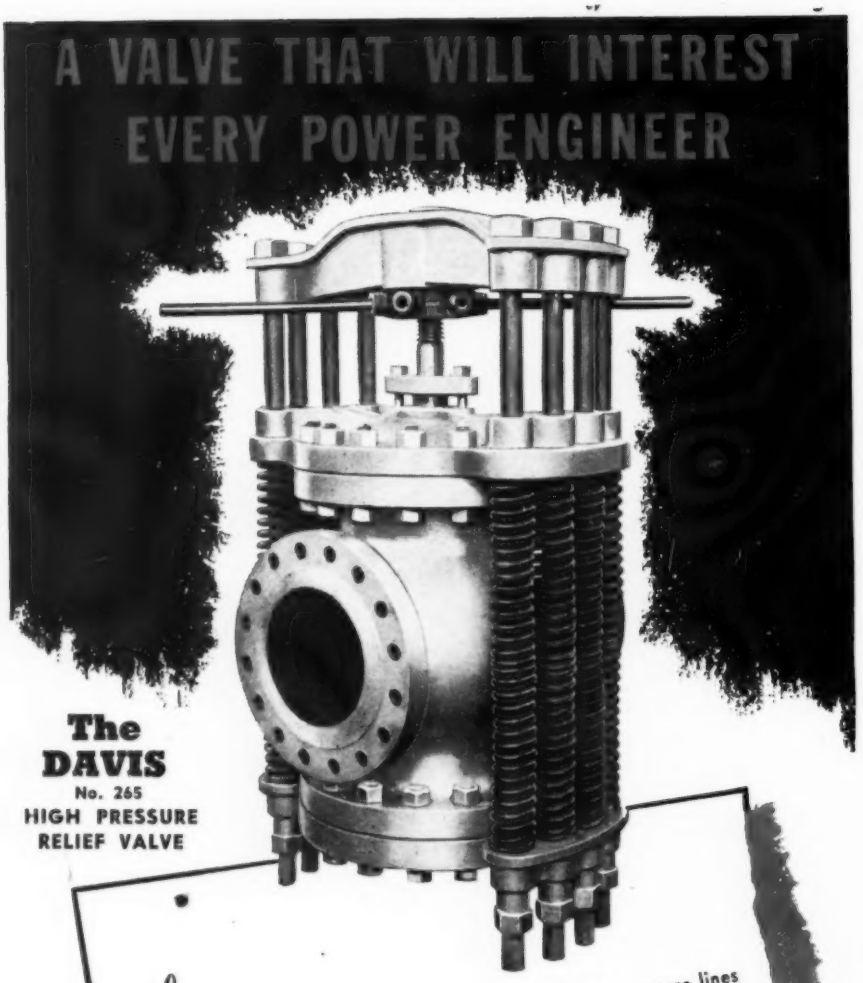
Modern line shaft hangers and pillow blocks equipped with Timken Tapered Roller Bearings are saving power and time and slashing maintenance costs in thousands of factories by eliminating friction and wear; simplifying lubrication; providing full protection against radial, thrust and combined loads; and holding shafts constantly in alignment.

Throw out those obsolete power wasters now and replace with Timken Bearing Equipped power savers. Make sure the trade-mark "TIMKEN" appears on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

A modern power-saving Dodge-Timken Pillow Block.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

A VALVE THAT WILL INTEREST EVERY POWER ENGINEER



The DAVIS
No. 265
HIGH PRESSURE RELIEF VALVE

for:

- Turbine relief on bleeder system.
- Relief of high pressure lines to low pressure lines at predetermined pressure.
- Protection of any boiler room or process equipment by relief to atmosphere.
- Plants carrying multiple boiler pressures to protect lower pressure systems.

The Davis No. 265 High Pressure Relief Valve, an exclusive Davis design offers numerous features of advantage:

1. Multiple springs — less spring accumulation—less buildup for maximum relief—less blowdown to close.
2. Requires appreciably less head room because of compact design with springs located at sides.
3. Center adjusting screw provides quick, easy change of pressure setting.
4. Can be supplied with test lever.
5. Available with hold open device.
6. Available in semi-steel or steel with bronze or stainless steel trim.
7. Size range 4" to 30".

DAVIS REGULATOR CO.

2540 Washtenaw Ave., Chicago, Ill.

DAVIS VALVES **DAVIS REGULATOR COMPANY**

A D Singh, of the Illinois Institute of Technology, and the experimental program under way for a locomotive gas turbine by J I Yellott, of Bituminous Coal Research.

Two heavy fuel consumers, the railroads and the power plants, received considerable discussion. Advances and improvements in operation and design of locomotive furnaces formed the subject matter for the railroad user while combustion controls, various types of dust collectors and a study of coal analyses contributed applicable suggestions to the heavy power-plant problem.

Brief Reviews

PROCESS-CONTROL TERMS *Technical paper No. 202, 26 pp, 8½x11. Available on request to Askania Regulator Co, 1603 S Michigan Ave, Chicago 16, Ill.* This booklet was prepared as a new edition of technical paper No. 100. Technical paper No. 202 is an illustrated dictionary covering usage of terms as recommended by Terminology Committee of Industrial Instruments and Regulators Div of American Society of Mechanical Engineers. It translates abstract terms and definitions into more realistic pictures of actual apparatus.

KEYSTONE COAL BUYERS MANUAL (1946) *28th edition, 500 pp. $10. Keystone Coal Buyers Manual, 330 W 42nd St, New York 18, N. Y.* A feature of this edition is a special new section "A Description of Seams" designed to give coal buyers authentic information on appearance, uses and burning characteristics of coals available from various seams throughout the U. S. This new section will also include average or range analyses and an "Index to Operators, by Seams." Regular directory sections include "Coal Sales Organizations," "Coal Trade Names," "Mechanical Cleaning Plants," and "Directory of Coal Mines."

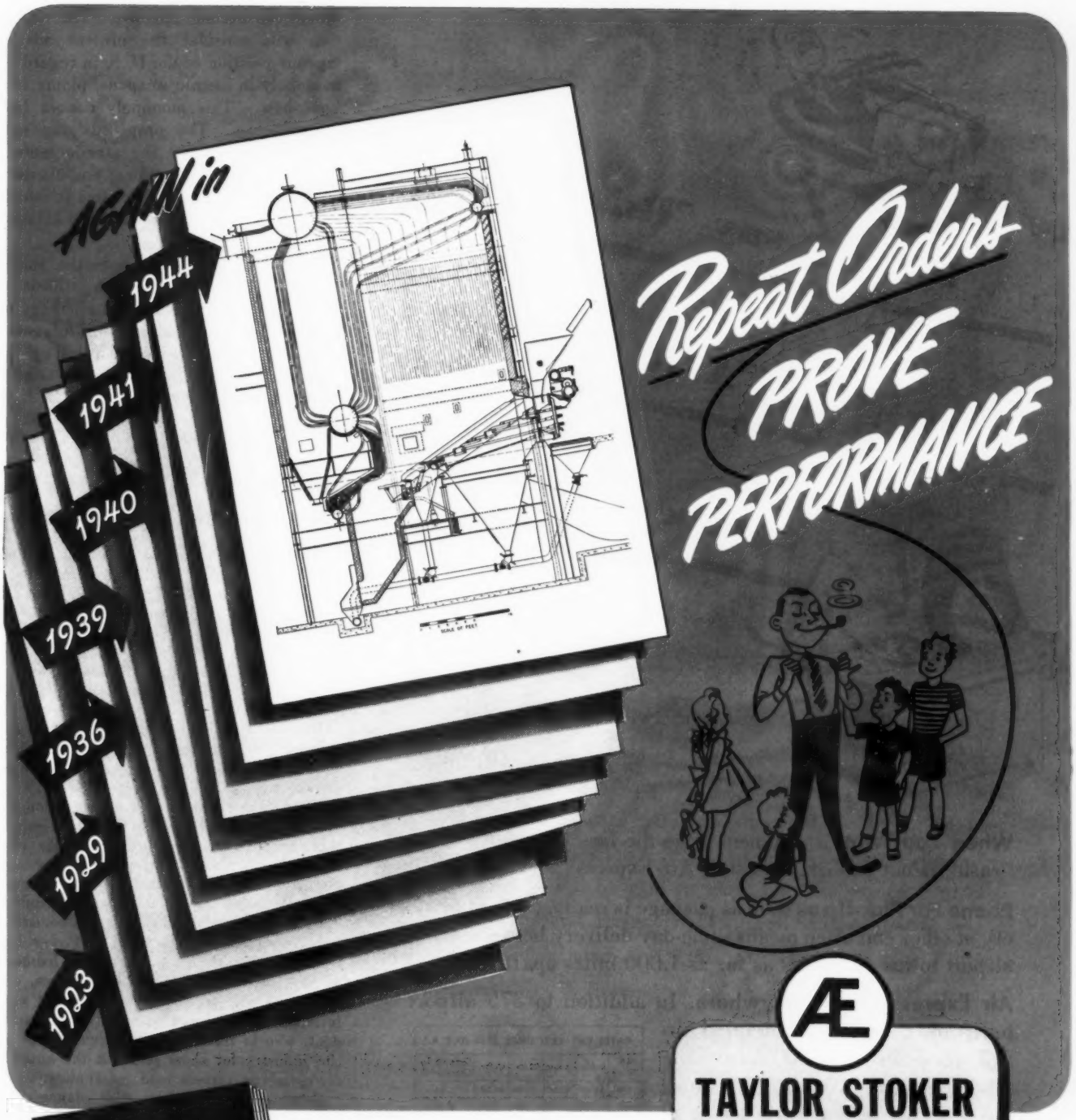
Atomic-Control Plan

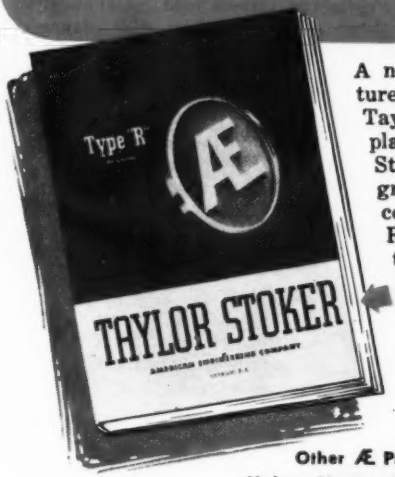
(*Continued from page* 102)

needs, without sacrifice of security. All power produced would be turned over to the nation at the busbar. Or the Authority might deliver steam to individual states, leaving all electrical production in national or private hands as determined by the policies of the particular nation. Nondangerous power plants using denatured fissionable material could be operated nationally or privately.

SECTION IV: TRANSITION TO INTERNATIONAL CONTROL

When fully in operation, the plan described in Section III, will give much security against surprise attacks by atomic weapons, but it will take much time to get it adopted and in complete operation. What will happen during transition? After the Authority has come into certain limited being, some preliminary steps must be taken before





A nationally known automobile manufacturer has consistently generated steam with Taylor Stokers since 1923. In the various plants of the company a total of 26 Taylor Stokers are in use. Naturally, when greater capacity was needed recently, this company turned to the new Taylor Type R Stoker which increased steam generation to a total of 1,500,000 lbs. per hour.

GET THE FACTS ON THE IMPROVED TYPE R

This easy-to-read 18 page bulletin will quickly bring you up-to-date on the advantages and improvements in stoker operations as provided by the AE Taylor Stoker. Write for it!

TAYLOR STOKER

AIR-COOLED & WATER-COOLED

The Only Underfeed Stoker with *all* these Features IN COMBINATION!

1. Continuous Self-Sealing Ash Disposal
2. Movable Ash Discharge Plates
3. Smooth-Flow Hydraulic Drive on Rear End
4. Independent Pusher Controls within 1/8 inch
5. Unique Sure-Feed Coal Agitators
6. Silent-Shift Spur Gear Planetary Power Transmission

Other Æ Products: Æ-Perfect Spread Stoker, Lo-Hed Hoists, Marine Deck Auxiliaries, Hele-Shaw Fluid Power.

AMERICAN ENGINEERING COMPANY

2400 ARAMINGO AVENUE, PHILADELPHIA 25, PA.

When You Want a shipment to go the fastest way, the word "rush" is not enough. Specify "Air Express" and be sure.

Phone For Pick-Up as soon as package is ready. Special delivery at other end often means same-day delivery between many airport towns and cities as far as 1,000 miles apart.

Air Express goes everywhere. In addition to 375 airport towns and cities, it goes by rapid air-rail schedules to 23,000 other communities in this country. Service direct by air to and from scores of foreign countries in the world's best planes, giving the world's best service.

RATES CUT 22% SINCE 1943 (U. S. A.)					
AIR MILES	2 lbs.	5 lbs.	25 lbs.	40 lbs.	Over 40 lbs. Cents per lb.
149	$1.00	$1.00	$1.00	$1.23	3.07c
349	1.02	1.18	2.30	3.68	9.21c
549	1.07	1.42	3.84	6.14	15.35c
1049	1.17	1.98	7.68	12.28	30.70c
2349	1.45	3.53	17.65	28.24	70.61c
Over 2350	1.47	3.68	18.42	29.47	73.68c
INTERNATIONAL RATES ALSO REDUCED					

Write Today for the Time and Rate Schedule on Air Express. It contains illuminating facts to help you solve many a shipping problem. Air Express Division, Railway Express Agency, 230 Park Avenue, New York 17, N. Y. Or ask for it at any Airline or Railway Express office.

AIR EXPRESS

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Representing the AIRLINES of the United States

others can become effective. The transition will consider the present advantageous position of the U. S. in regard to monopoly in atomic weapons, plants and know-how. This monopoly cannot last in any case. The proposed plan will involve giving away the atomic secrets gradually to other nations, and thereby somewhat speeding up the time in which they can achieve an international balance of atomic power.

Should the worst happen—the entire effort collapse during the transition period—the U. S. will be at all times in a favorable position with regard to atomic weapons. When the plan is in full operation there will no longer be any secrets about atomic energy.

Annual Oil & Gas Power Conference in Milwaukee

Oil and Gas Power Div of American Society of Mechanical Engineers, resuming a practice interrupted in 1945 by reason of government ban on conventions, will hold its 18th national conference on June 12-15, 1946, at Hotel Schroeder, Milwaukee, Wis. The newest developments in railroad diesels, gas turbines and gas diesels will be featured in technical sessions of the conference.

Because of the excellent possibilities for worth-while plant-inspection trips in Milwaukee and vicinity, only one afternoon session will be held, on opening day, Wednesday, June 12; trips will be made on all other afternoons. The innovations of simultaneous technical sessions on Friday and Saturday mornings and an evening session on Friday have been planned to accommodate the many important papers scheduled.

Diesel Engine Manufacturers' Association will cooperate with Oil and Gas Power Div by sponsoring the program of the banquet to be held on opening day. E J Kates, div chairman, will preside at the banquet and introduce E J Schwannhauser, DEMA president, who in turn will call on executives of the industry for short talks on the outlook for diesels in various fields of application.

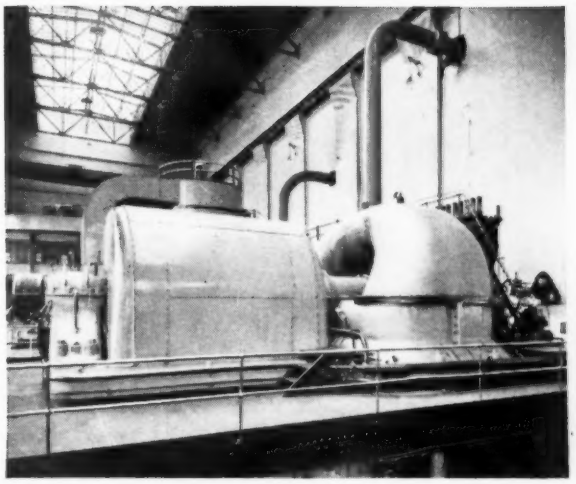
Other social events are also planned. A luncheon on opening day, midday social hours on Thursday and Friday, and one of the famous O&GP social evenings on Thursday, have been definitely arranged. A short talk on "History of the Diesel-Electric Locomotive" will be a feature of the Wednesday luncheon.

As at past conferences, manufacturers of diesel engines and accessories will show their products in attractive booths in close proximity to the meeting rooms.

Under the guidance of Robert Cramer, a special committee of the ASME Milwaukee section, of which T E Wetzel is chairman, is making arrangements for the sessions, inspection trips and social events. Bruno V E Nordberg will be honorary chairman of the conference; general details are in charge of E J Kates and L N Rowley, chairman and secretary, respectively, of O&GP Div and R Tom Sawyer, chairman of the meetings and papers committee.

A 13-year record of operation on oxidation-inhibited

NONPAREIL
TURBINE OIL



THE 20,000 KW Turbine pictured has operated since 1933 on Nonpareil Turbine Oil without replacing oil, without removing oil for treating, and without cleaning the turbine oil system.

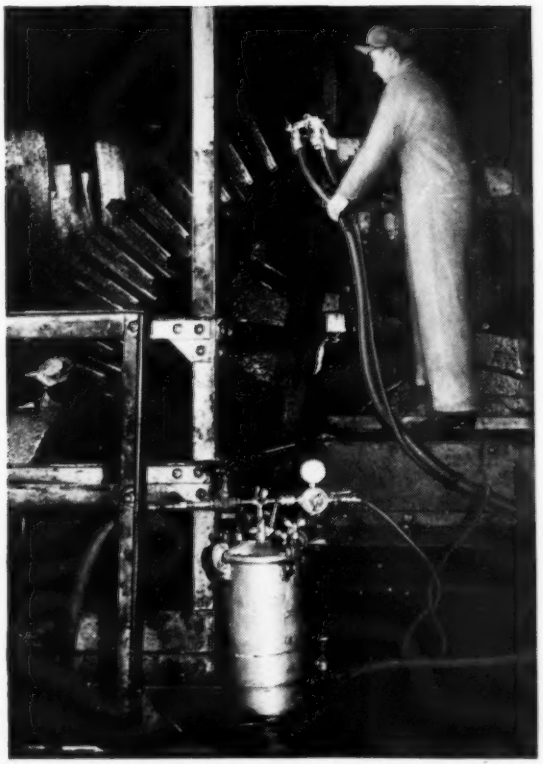
There are reasons behind this typical Nonpareil record—and here they are. Asphaltene formers are removed from Nonpareil during refining, thus eliminating deposit formation caused by oil deterioration. In addition, Nonpareil contains an oxidation inhibitor which prevents acidity formation.

Because of these two outstanding advantages, which Nonpareil has offered for 18 years, Standard Oil can guarantee Nonpareil for the life of your turbine. A Standard Oil Lubrication Engineer will be glad to show you this written guarantee and discuss its advantages. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

This chart shows the neutralization number (as determined by A.S.T.M. Method D 188-27T), of Nonpareil during 13 years of operation in the 20,000 KW Turbine in a Midwest utility plant. Nonpareil is guaranteed not to exceed 0.15 Mg KOH/gm for the life of the turbine.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

An improved gear lubricant that can be sprayed on gears...



One method of spraying gears is pictured above. Grease under pressure in the tank is carried to the spray gun in the large hose. A separate air hose to the gun provides pressure to break up the grease into a fine spray.

CALUMET Viscous Lubricant

- Saves time in application
- Gives smooth, even film
- Reduces frequency of application
- Reduces throw-off

Calumet Viscous Lubricant is not the old type of gear shield usually made from residual products of petroleum. It is a true grease, manufactured from selected soaps and oils plus additives to secure the qualities most needed in a gear shield. In addition, a range of grades is provided, to meet all plant conditions under which gears operate.

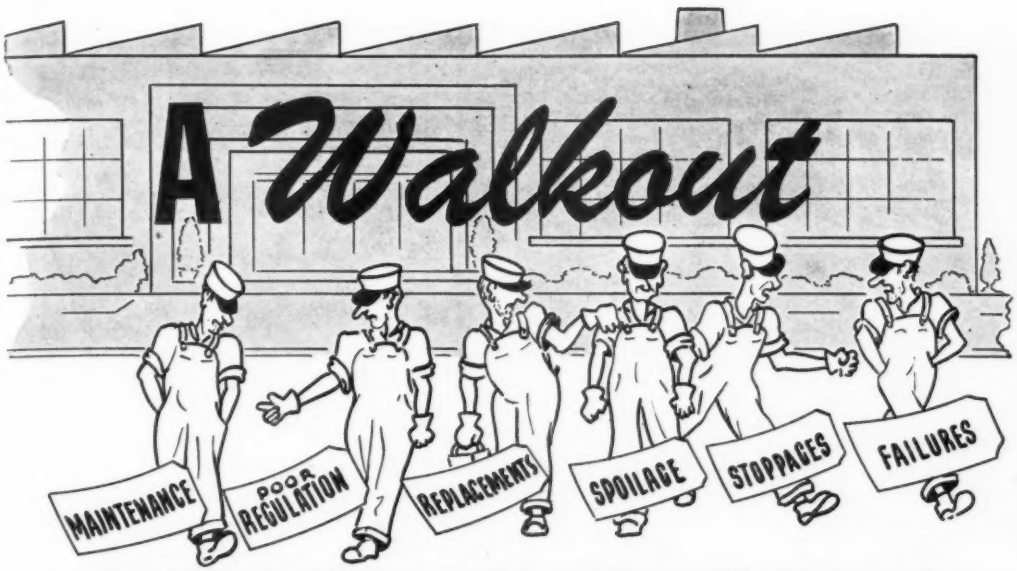
That is why Calumet Viscous Lubricant gives the advantages listed above. Because all grades can be applied without heating, and all except the heaviest grade can be sprayed, it cuts application time to the minimum. Spraying also gives a smooth, even coating of lubricant, eliminating bare spots or excessive deposits which may drop off before the lubricant is worked into the gears.

An additive in the lubricant gives it improved wetting ability—that's the ability to adhere closely to the metal—so as to give better resistance to water and heat.

Let this wear-reducing lubricant protect your plant gears. A Standard Oil Lubrication Engineer will survey your plant and help you determine the grades you need and the most economical methods of application.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE



WELCOME AND PROFITABLE IN ANY PLANT . . . . . .

TO BRING IT ABOUT, USE THE CASH STANDARD *Streamlined* PRESSURE TYPE 1000 REDUCING VALVE

Maximum Capacity When Needed Most • Accurate Pressure Control Under Toughest Working Conditions Trouble-Free Service • Smooth Operation • Tight Closure • Accurate Regulation • Speedier Production Results • Elimination of Failures • Constant Delivery Pressure • Cost Saving Operation • No Spoilage • Practically Zero in Maintenance Costs

These bad actors never fail to take a walkout powder when the CASH STANDARD "1000" goes to work. And . . . it's a walkout that's a stay-out! For they have no part to play in good streamlined valve performance.

You'll see all this for yourself as soon as you install the "1000" valve.

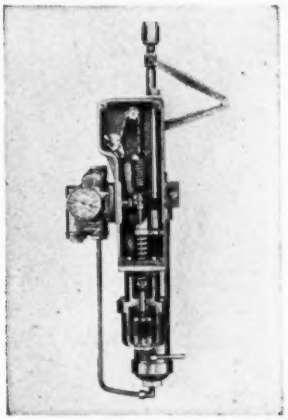
To find out about its streamlined design which means so much in dependability and to know exactly how this CASH STANDARD Streamlined "Type 1000" Pressure Reducing Valve works, send now for Bulletin "962."

CASH STANDARD CONTROLS.. VALVES

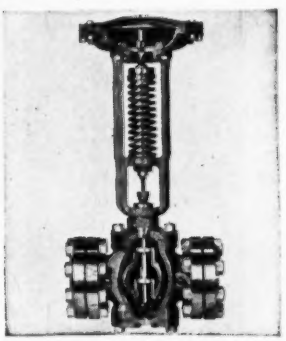
A. W. CASH COMPANY
DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES

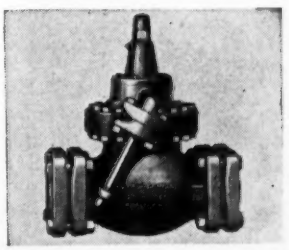
Send for them



Bulletin 963 features the CASH STANDARD Type 100 Series of Super-Sensitive Controllers — various types for automatically operating valves, dampers, rheostats, stokers, pulverizers, fans, and other apparatus. 16 pages filled with descriptions and applications.



Bulletin 968 features the CASH STANDARD Type 34 Pressure Reducing Valve — direct operated — direct acting for handling steam, hot water, cold water, air, oil, brine—and most liquids and gases except some injurious chemicals. Illustrates and describes the different styles available and tells about their applications. Three pages of capacity charts.



Bulletin 956 features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

- Cadmium Plated For Protection Against Corrosion and For Better Appearance
- High-Grade Woven Monel Wire Screen
- Readily Removed Steel Blow-Off Bushing
- Screen and Bushing Come Out Together—Go Back Together, Automatically Aligning
- For Steam Lines or Water, Oil and Other Fluids
- Reasonably Priced
- 6 Sizes from ½" to 2" for Pressures up to 600 lbs
- Many Thousands in Service
- Sold by Over 100 Mill Supply Houses

See Your Supply House or Send for Bulletin S-201

YARNALL-WARING COMPANY
100 Mermaid Avenue PHILADELPHIA 18, PA.

YARWAY STRAINERS

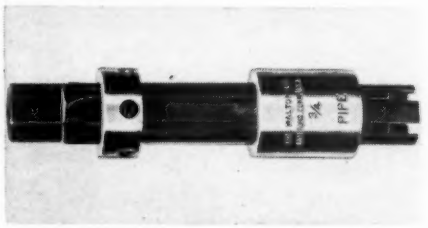
New Equipment

(*Continued from page* 132)

out the heater after it has performed its function or to handle lead current is eliminated.

Among its applications are: (1) to protect gas-filled rectifiers and thyratrons by delaying application of plate voltage until cathode reaches operating temperature; (2) to guard against effects of transient currents in control circuits. It also performs functions usually served by other relay designs when absolute silence and freedom from maintenance are required, and it serves as an over-current or over-voltage warning or controlling device.

Model 501 relay is rated at 6 amp and will make or break this current up to 450-v ac and 250-v dc. This relay is supplied with heaters for operation on voltages up to 150 v. Heater normally consumes 5 watts and presents a noninductive load to its controlling device. **Dept P, Instrument Div, Thomas A Edison, Inc, West Orange, N. J.**



Tap Extractors

FOR ACCURATE, quick and easy removal of broken pipe-threading taps, a group of ten new pipe-tap extractors have been added as stock sizes to Walton line. These pipe-tap extractors are available for all sizes of hand and machine-screw pipe taps from ⅛ to 1 in. for both regular and interrupted thread styles. **Dept P, Walton Co, 94 Allyn St, Hartford 3, Conn.**

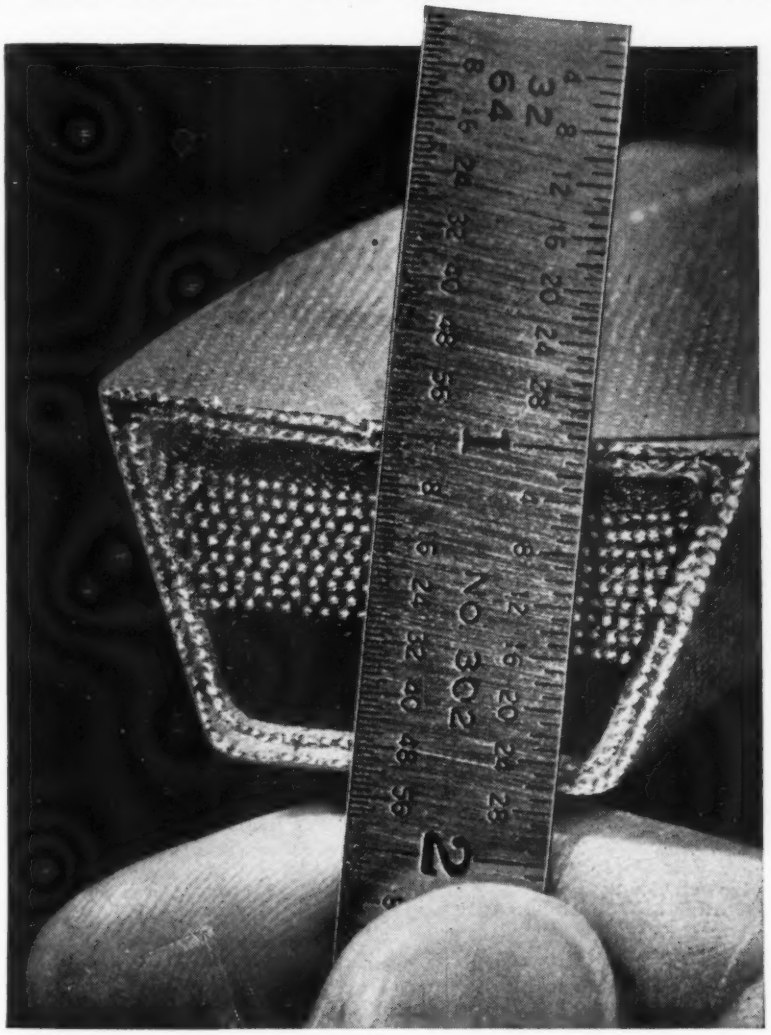
Fire-Fighting Units

NEW FOG UNIT is built in two models. Model 1030 has a shorter hose and smaller cabinet than Model 1033, which has 100 ft of one-in. hose. Unit connects direct to a water line. Swing-joint mounting on wall or stand pipe makes it possible for cabinet to revolve in alignment with direction of hose pull.

Valve-actuating fixture holds fog nozzle for instant application and fog appears at nozzle, according to maker, within four seconds after someone reaches for the hose. Automatic valve releases spray to full capacity instantly upon removing nozzle from cabinet fixture. The special nozzle supplies a finely atomized fog with only a medium pressure. Fog nozzle throws up a protecting wall in front of operator, shielding him from intense heat of blaze. Fog also dilutes the vapor and washes the air behind the nozzle so operator may safely enter a gas- or smoke-filled area.

To provide protection where it is impos-

BALANCED CONSTRUCTION



Makes TEXROPE V-BELTS Run Cooler... Smoother...Longer

Look at this cross-section of a TEXROPE Super-7 V-Belt. This balance between rubber, cord and fabric — the weight of cover — position of load carrying cords — thickness of cushion — width and depth of belt — have been carefully engineered. They've been proved on the machines of American industry through 20 years of successful operation.

This long experience has developed other advantages, too: *50% Stronger Cords,* of long staple hard-twisted cotton — *Tough Duplex Cover* to take the wear, seal out dirt and grit — *Thick Cushion* of cool-running improved Buna-S to protect the cord structure from shock.

YOUR V-BELT DRIVE HEADQUARTERS

Call your Allis-Chalmers office or dealer for TEXROPE Super-7 V-Belts — for full range of standard, "Magic-Grip" and Vari-Pitch sheaves — for Speed Changers and complete V-Belt Drive engineering help. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 2034

HEAR THE BOSTON "POPS":
Every Saturday Evening, American Broadcasting Co.

WHICH TEXROPE Super-7 DO YOU NEED?

Pick the right TEXROPE Super-7 V-Belt — it'll give you the most in efficient power transmission and economy.

TEXROPE Super-7 V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by A-C.

Heat-Resisting Super-7
Stands temperatures up to 180°. The TEXROPE V-Belt for most drives.

Oil-Resisting Super-7
Neoprene cover protects core against moderately oily or greasy conditions.

Oil-Proof Super-7
Made of Neoprene throughout. Use it when the belt must swim in oil.

Static-Resisting Super-7
Recommended where explosion hazard exists. Static-conducting element throughout cover won't wear off.

Super-7 Steel
Twin steel cables, to pull extremely heavy loads with minimum stretch.

GET THEM — through your Allis-Chalmers district office or dealer.

ALLIS (AC) CHALMERS TEXROPE V-BELT DRIVES

RODA

High grade gas, by-product and steam coal from Wise County, Va., on the Interstate Railroad.

DENDRON

High grade gas, by-product, steam and domestic coal from Wise County, Va., on the Interstate Railroad.

STONEGA

High grade, high volatile steam and by-product coal from Wise County, Va., on the Interstate Railroad.

PREMIX STOKER

A laboratory controlled product blended to meet exacting stoker requirements. From Wise County, Va., on the Interstate Railroad.

COKE

Roda and Stonega from Wise County, Va., and Connellsville Coke from Pennsylvania.

CRITERION COAL

High grade gas, by-product, steam and domestic coal—Pittsburgh seam from Irwin Basin, Westmoreland County, Pennsylvania, on the Penna. Railroad.

CROZER

Genuine Third Vein Pocahontas from McDowell County, W. Va., on the Norfolk & Western Railroad.

LYNCO

Medium volatile, high fusion coking coal for by-product and steam use from Wyoming Co., W. Va., on Virginian Ry.

Old Kentucky

Hazard No. 4 and No. 7 steam and domestic coal from Wiscoal, Knott County, Kentucky, on the L. & N. Railroad.

CHARMCO

Unexcelled Steaming Coal from the Fire Creek Seam in Greenbrier County, W.Va., originating on the N.F.&G.R.R.

ANTHRACITE — Hazle Brook Premium . . . Raven Run

General Coal Company

123 SOUTH BROAD STREET, PHILADELPHIA 9, PA.

BRANCHES:

BLUEFIELD, W. VA. BOSTON BUFFALO CHARLOTTE, N. C.
CINCINNATI DETROIT NEW YORK NORFOLK PITTSBURGH

sible to reach a flame with fog, new Bowser unit is also equipped with a standard solid-stream nozzle. The hose stows easily with a "figure 8" winding that avoids kinking. **Dept P, Bowser, Inc, Fort Wayne, Ind.**

Bronze Welding Rod

OXWELD No. 25M flux-coated bronze welding rod is for application by oxy-acetylene process. This rod combines properties of *Oxweld* No. 25M bare bronze rod with correct fluxing. When rod is made, it is precoated with flux in proper proportion to its size. This coating consists of *Brazo* flux plus a nonactive binder that does not affect the weld. It adheres firmly to rod, melting down into molten puddle without burning off ahead of rod. Rod can be heated and bent without destroying coating. In addition, weather does not affect coating. **Dept P, Linde Air Products Co, 30 E 42nd St, New York 17, N. Y.**

Solenoid Valve

NEW SOLENOID VALVE serves for applications in which a small electrically controlled valve is required to perform efficiently with a minimum of maintenance. It weighs only one lb and requires a power consumption of 10 watts max. Valve operates under pressures up to 150 psi. It is a 3-way 2-position valve and may serve with water, alcohol, hydraulic fluids, air and other media. This valve is for ac or dc operation and for intermittent or continuous duty. Construction features stainless steel for all parts in contact with fluid handled, coil impregnated to withstand moisture and stems welded to assure positive, unfailing joints. **Dept P, Allied Control Valve Co, S Norwalk, Conn.**

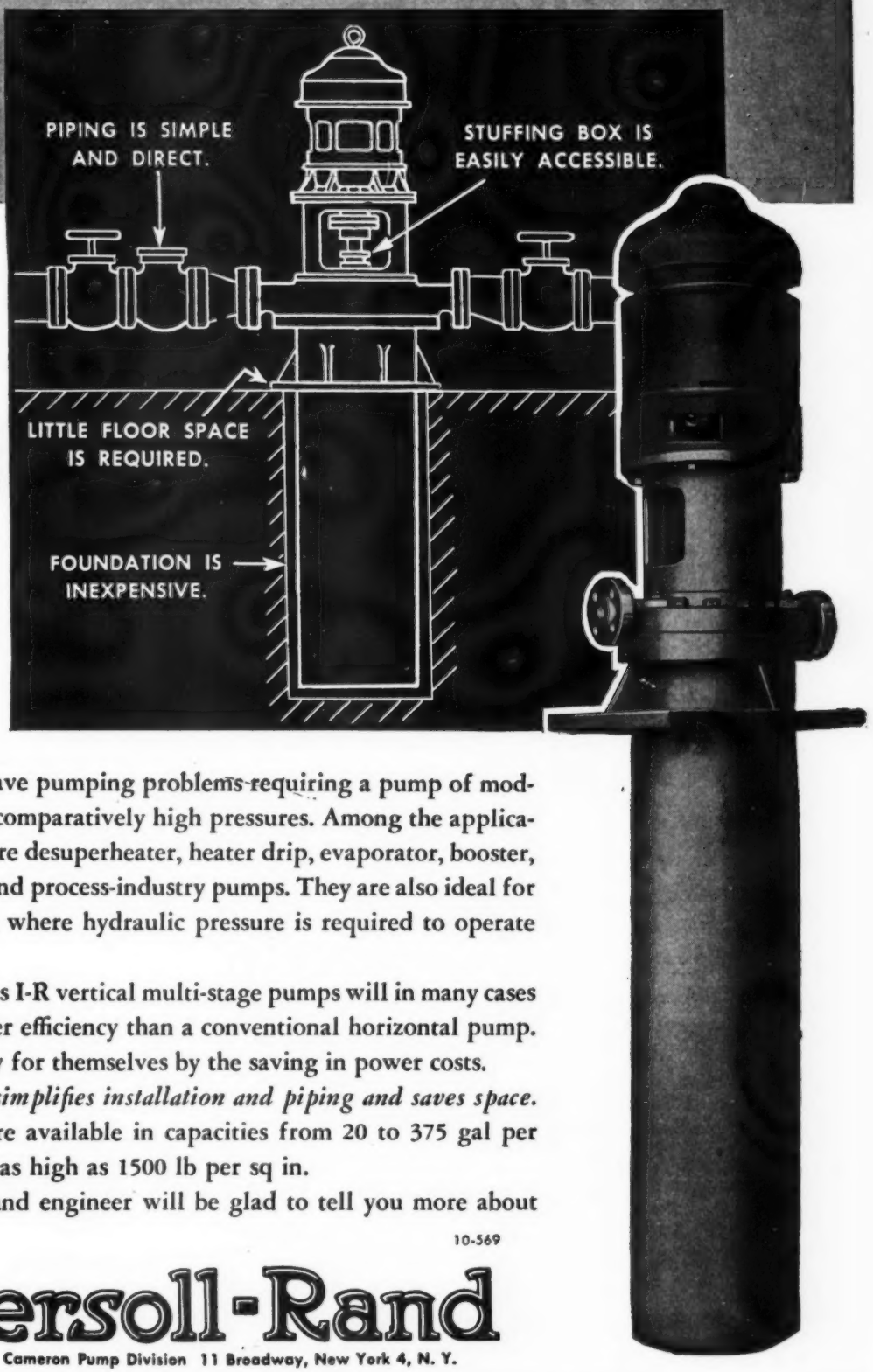
Beryllium-Aluminum Alloys

TWO BERYLLIUM-ALUMINUM ALLOYS are now in commercial production: Master alloy containing about 5% beryllium, 5% magnesium, remainder aluminum; and master alloy containing about 20% beryllium, 15% magnesium, remainder aluminum.

Known uses for beryllium include: (1) decreasing, to extent of 0.03%, dross formed in castings of magnesium-aluminum alloys

for **LOW-CAPACITY HIGH-PRESSURE**

PUMPING JOBS


PIPING IS SIMPLE AND DIRECT.
STUFFING BOX IS EASILY ACCESSIBLE.
LITTLE FLOOR SPACE IS REQUIRED.
FOUNDATION IS INEXPENSIVE.

VERTICAL MULTI-STAGE PUMPS

Many industries have pumping problems requiring a pump of moderate capacity for comparatively high pressures. Among the applications of this type are desuperheater, heater drip, evaporator, booster, small boiler-feed and process-industry pumps. They are also ideal for many applications where hydraulic pressure is required to operate presses.

For these services I-R vertical multi-stage pumps will in many cases have a much higher efficiency than a conventional horizontal pump. They will thus pay for themselves by the saving in power costs.

Vertical design simplifies installation and piping and saves space.

These pumps are available in capacities from 20 to 375 gal per min for pressures as high as 1500 lb per sq in.

An Ingersoll-Rand engineer will be glad to tell you more about them.

10-569

Ingersoll-Rand

Cameron Pump Division 11 Broadway, New York 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

Is It Difficult to Find Good Firemen?

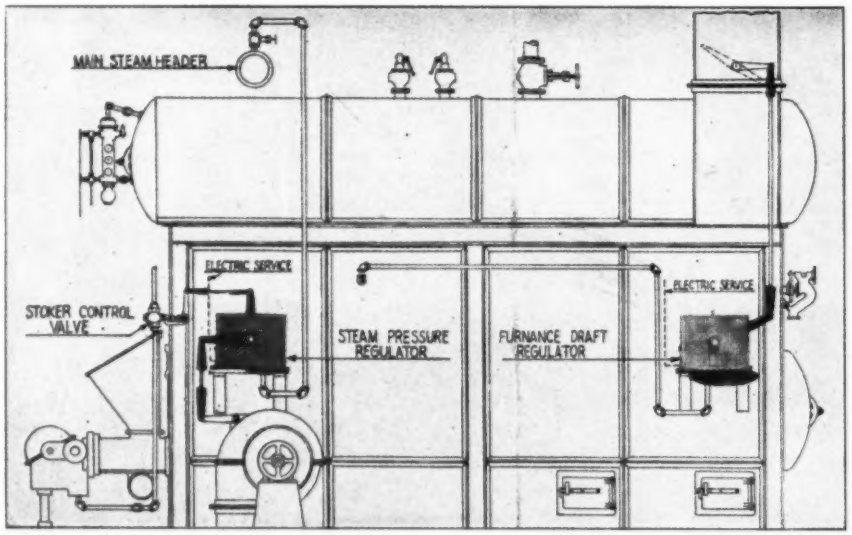
•

If So, You Will Want This

COMBUSTION CONTROL

•

BROOKE REGULATORS HAVE BEEN APPLIED AS SHOWN FOR 20 YEARS!



Application of steam pressure regulator to control forced draft air and stoker speed. Furnace draft regulator applied to uptake air damper.

Advantages of this arrangement:

1. **Simplicity.**
2. **Hand Control from switch on regulator.**
3. **All Brooke Regulators are electrically actuated, and do *not* require any water or compressed air for operation.**
4. **No pilot valves, stuffing boxes or strainers are used.**
5. **Rigid link connections used throughout. No pulleys—no chain—no cables!**

Brooke's Steam Pressure Regulator type JSC controls forced draft air either by means of damper or by changing fan speed. It also controls stoker speed (or fuel oil) to furnace by means of fuel control valve. Furnace draft regulator type JFC operates boiler outlet damper to maintain furnace draft within .01" H_2O.

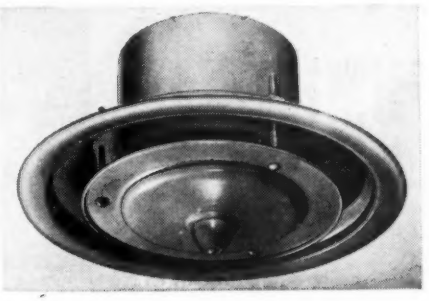
For further details write without delay for illustrated booklet.

BROOKE ENGINEERING CO., INC.
1517 Wayne Avenue • Philadelphia, Pa.
MANUFACTURERS OF THE FIRST SUCCESSFUL ELECTRIC EYE SYSTEM OF COMBUSTION CONTROL

containing 3 to 10% magnesium (2) increasing substantially mechanical properties in 10% magnesium alloys (3) increasing corrosion resistance of aluminum alloys (4) retarding the burning of molten ASTM-4 magnesium alloy. In 4, beryllium, when introduced through a beryllium-aluminum master alloy, and present to as small an extent as 0.001%, acts to form a tenacious protective surface film when alloy is heated. **Dept P, Beryllium Corp of Pennsylvania, Reading, Pa.**

Chrome Paint

CHROMATONE is said to hold full brilliance and color at all times and has less tendency to tarnish after application. Patented stabilizer used in its manufacture gives package stability, according to maker, and prevents paint darkening in the can even after opening. For indoor or outdoor application on a wide variety of metal, wood, glass, etc, *Chromatone* is packaged ready for instant application. As it is a rust and heat-resistant coating, it may be applied on heaters, radiators, plumbing, etc. Paint sets in 20 min., dries in two to four hr. It is equally suited to brush or spray gun and dries without leaving brush marks or laps. **Dept P, Alumatone Corp, 1523 Grande Vista, Los Angeles 23, Calif.**



Diffuser Cap

TAMPERPROOF CAP has been added to base of damper control screw in standard Type *K* (supply air only) *Kno-Draft* adjustable diffuser. Centered in the *B*, or lower cone, cap must be removed with a Phillips head screwdriver to provide access to damper screw. Thus the volume-control damper, an exclusive feature of this diffuser, may now be set for required amount of air without danger of a subsequent change, which might upset the entire system's balance. **Dept P, W B Connor Engrg Corp, 114 E 32nd St, New York 16, N. Y.**

Dual-Purpose Machine

BATTERY-CHARGER ARC-WELDER COMBINATION was designed especially for railroads, but is adaptable to a wide variety of shops where batteries are charged and electric arc-welding is done. It has complete, separate control panels with instruments—one for each battery circuit and one for welding circuit. You can switch from charging to welding or from welding to charging as easily as you can operate a charger or welder separately.

Model No. 496 is a Hobart 300-amp electric motor-driven welder, including MGC panel circuit for charging one railway coach

Eight Improvements

GENUINE **STRONG** 70 Series Traps

Better than Ever!

Look at these new features:

1 Renewable seat replacing pressed-in design;

2 Anum-Metl* valve and seat with new scientifically designed Hi-Cap* (patent applied for) orifice . . . up to 25% greater capacity;

3 Oversize inlet and outlet ports—increased flow capacity;

4 Relocated inlet and outlet connections—avoids backflow on light loads;

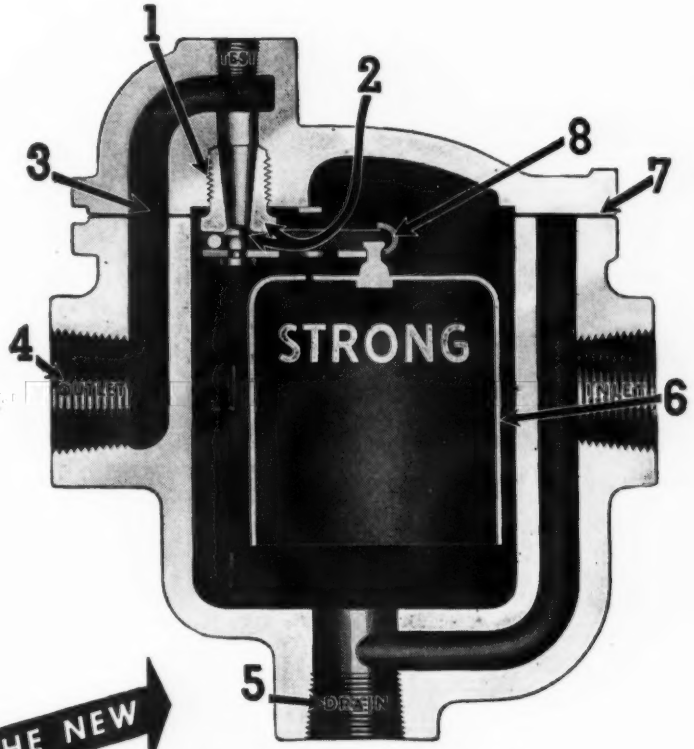
5 Drain connection added—available for bottom inlet;

6 One-piece, deep-drawn, stainless bucket—no welds;

7 Larger gasket area—means positive seal;

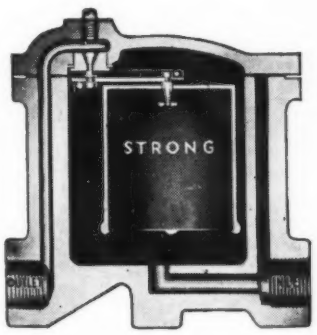
8 New, improved, stainless, high-ratio leverage.

Plus Adaptability to older models with change-over assembly including Hi-Cap orifice.



New 70 Series Strong Trap, No. 170

COMPARE THE NEW WITH THE OLD



Old 70 Series Strong Trap

In improving the 70 Series trap, Strong has remembered the thousands of older style 70 Series traps still in service after many years. Each improvement bears the "proof in service" label, so Strong quality remains uniformly high. Service continues to be available on all Strong traps, and they can be completely modernized to include the improvements listed above.

With a complete line of Strong open and inverted bucket traps at their disposal, Strong engineers can specify exactly the right type of trap for your particular application. For full details, write for the new Strong Catalog No. 67.

STRONG, CARLISLE & HAMMOND COMPANY, Cleveland 13, Ohio

*Registered Trade Mark

REG. TRADE MARK

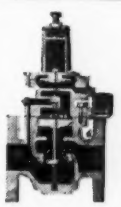
OTHER ANUM-METL Reg. Trade Mark

STRONG

STEAM SPECIALTIES

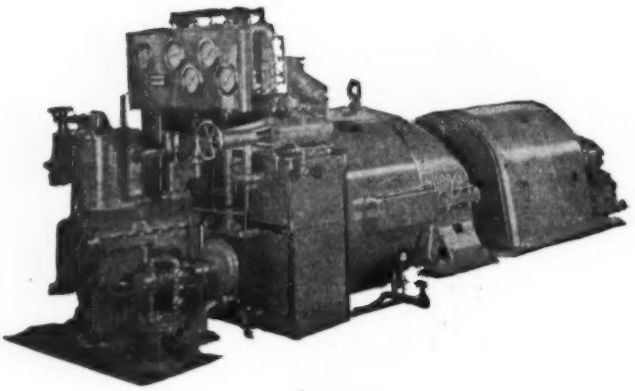
Strainer

No. 80 Series Trap



Reducing Valve

MURRAY
STEAM TURBINE GENERATING UNITS



Installed in 1939 in a small municipal power plant in northeastern Indiana, the above 500 KW direct connected Murray steam turbine generator set has given its owner entire satisfaction. The turbine is equipped with every device necessary for minimum of attention including steam turbine driven auxiliary oil pump. The generator and exciter may be furnished to match existing electrical equipment in your plant.

Units in this size may be furnished either direct connected or geared as preferred with performance and operation equally trouble-free.

There is a Murray representative ready to help you with design and layout information.

MURRAY *also produces*

Mechanical Drive Turbines — Horizontal and Vertical Reduction Gears of the high speed type Steam Boilers

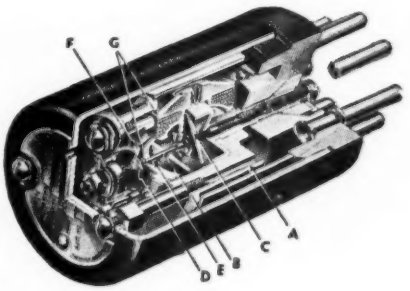
MURRAY IRON WORKS COMPANY
BURLINGTON, IOWA
Builders of Steam Power Equipment for Three Quarters of a Century

battery at a maximum rate of 200 amp at 50 v, dc. Model No. 497 is a Hobart 400-amp electric motor-driven welder, including MGC panel circuits for charging two railway coach batteries at one time and at a maximum rate per battery of 150 amp at 50 v, dc.

Each MGC charging circuit includes following: (1) Voltmeter for measuring voltage of generator or battery, or both (2) ammeter to indicate charging current (3) 200-amp knife switch to open charging circuit (4) 175-amp *Fusetron* in charging circuit (5) automatic reverse-current cutout to prevent flow of current from battery to generator. Welders are Hobart multi-range dual-control electric drives with special remote control and other improved welding features of Hobart welding generators. **Dept P, Motor Generator Corp Div, Hobart Brothers Co, Hobart Sq, Troy, O.**

Hydraulic and Air Cylinders

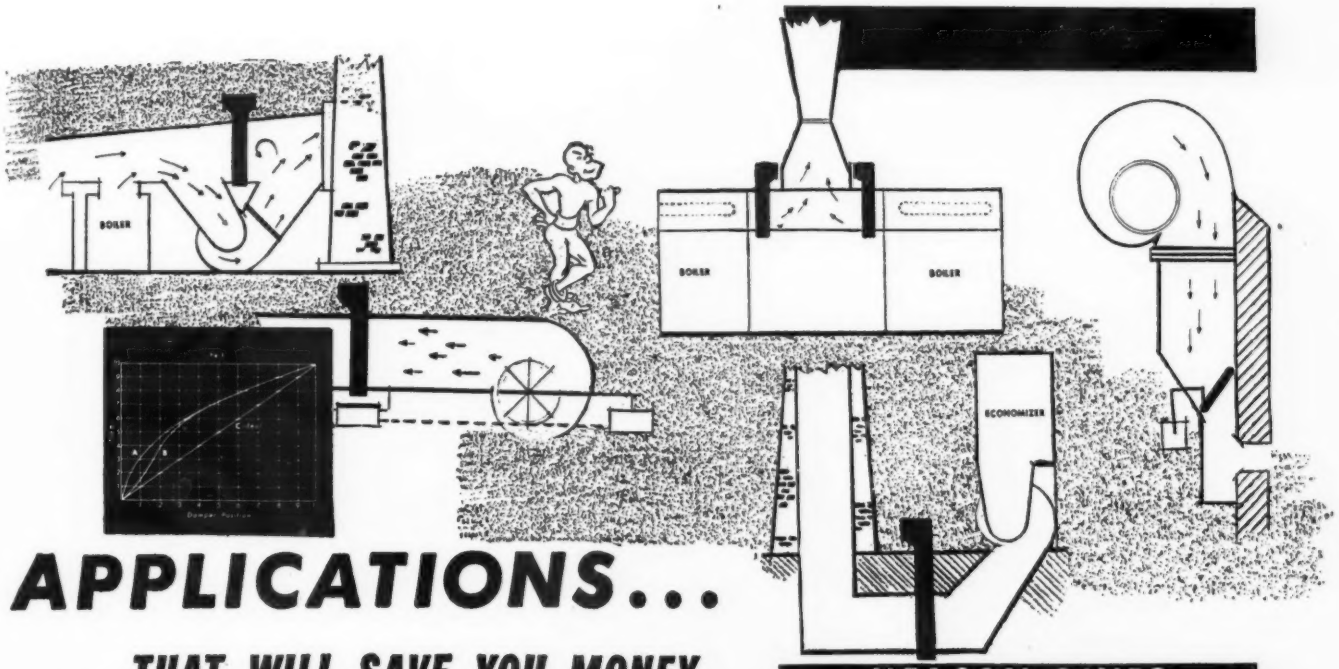
WITH ALL-STEEL HEADS, caps and separate interchangeable steel mountings, new line of hydraulic and air cylinders are universal and may be mounted either directly on extended tie rods or attached to rods with any of the standard bracket styles. By simply changing steel brackets, it is possible to adapt a cylinder to different uses. Also offered are special tie-rod mountings that extend on either or both ends of cylinder. **Dept P, Miller Motor Co, Chicago 18, Ill.**



Magnetic Relay

SENSITIVE MAGNETIC RELAY, Model 103, is for electronic and industrial fields where relays are required for operation on currents of thermocouple and photocell magnitudes and in equipment where compactness, light weight and dependability under vibration are of primary importance. It is particularly useful as a polarized relay in vacuum-tube circuits, in balanced circuits and in applications requiring pull-in and drop-out at essentially same current or voltage. In extremely delicate control circuits, this relay can be employed to help "shrink" mechanical design by eliminating intermediate amplification. Entire mechanism is protected against weather and dust by a gasketed metal cover and it is balanced to allow operation in any position.

Contacts handle ⅓ amp in a non-inductive load circuit and provide either SPST or SPDT switching. Operating power is normally about 10 microwatts although for some circuit applications it may be less than 1 microwatt. Coils will safely dissipate 2 watts, allowing differential operation on large currents while construction will with-



APPLICATIONS...

...THAT WILL SAVE YOU MONEY AND GIVE MORE EFFICIENT OPERATION

IN the power field, Heacon Dampers have been installed as uptake dampers, bypass dampers, isolation dampers and in many other applications.

Above are shown sketches of a few of these. Each is an actual problem solved. Each resulted in operational savings and greatly increased efficiency. In many cases, outage time for maintenance was cut from thirty to fifty percent.

Regardless of the damper application, if tightness and control are necessary factors, Heacon Dampers are the *only* solution.

The Heacon Catalog No. 10 will give details of this outstanding new damper. Write for it.

THERMIX ENGINEERING COMPANY
Project and Sales Engineers
FIRST NATIONAL BANK BLDG., GREENWICH, CONN.

HEACON GIVES CONTROLLED FLOW

1. MORE RELIABLE OPERATION
2. INCREASED CAPACITY
3. REDUCED MAINTENANCE
4. GREATER FLEXIBILITY
5. HIGHER EFFICIENCY
6. BETTER REGULATION
7. LOWER BANKING LOSSES
8. QUICKER STARTING
9. SAFER OPERATION
10. CLEARANCE WITHOUT LEAKAGE

HEACON INC DAMPERS

FIELD PROJECT ENGINEERS:

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Control within negligible limits of variation

Valves built to meet exacting requirements in the control of steam, liquids and air. Types, sizes and construction for specific requirements and conditions in wide field of application.

ACCURATE, DEPENDABLE PRESSURE REGULATION

(At right) Stickle Standard Regulating Valve. Double seated, semi-balanced. All working parts renewable. Seven sizes—½" to 6".

(At left) Stickle Single Seated, Balanced Valve. Internal parts interchangeable. May be repaired at point of service. Eight sizes—¼" to 4".

(At left—below) Stickle Spring Balanced Valve. Diaphragm case detachable. Renewable valve and seat. ½", ¾" and 1" sizes for individual installations on small equipment.

(At left) Stickle Standard Back Pressure Release Valve—double seated, unbalanced type. Designed to meet various operating pressures. Ten sizes—3" to 16".

LONG LIFE

STICKLE VALVES

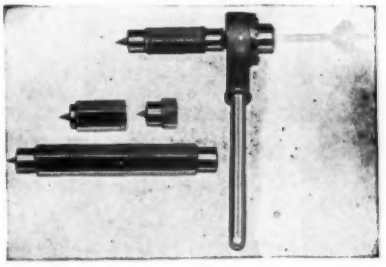
REDUCING . . . REGULATING

● Stickle Series 400 Valves—single seated with pilot stem—illustrated and described in Bulletin No. 435, and Stickle Series 200 Double Seated Valves, illustrated and described in Bulletin No. 235 are available in three constructions: Lever Operated; Lever and Weight Loaded, Diaphragm Operated; and Spring Loaded Diaphragm Operated. Self-contained and Pilot Operated. Proved by long use in fields where dependability and accuracy are required. Ask for Bulletins.

STICKLE STEAM SPECIALTIES CO., 2265 Valley Ave., Indianapolis, Ind.

stand substantial overloads without damage when used as a simple relay.

Magnetic system of Edison sensitive magnetic relay is inclosed in a highly permeable metal shield (*A*) which protects it from stray external magnetic fields. Rotor (*B*) is pivoted in spring-loaded jewel bearings and has a small *Alnico* vane (*C*) at its lower end. At its upper end it has a hairspring (*D*), a balance cross with weights (*E*), and a platinum iridium contact arm (*F*). Magnet vane is positioned between two parallel stationary coils (*G*) whose magnetic fields are coincident. **Dept P, Instrument Div, Thomas A Edison, Inc, West Orange, N. J.**



Ratchet Drill Driver

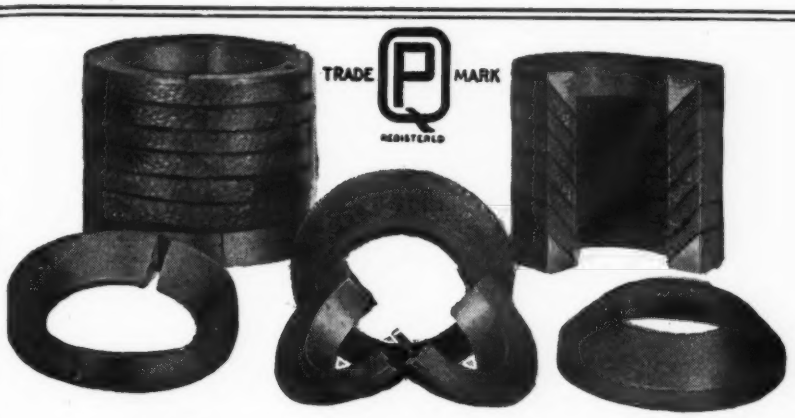
FOR DRILLING between studs and joists or restricted spaces in buildings or other structures, Liberty ratchet drill driver gives positive feed at each turn of drill bit. Compact head allows centering of holes within 1¼ in. of nearest obstruction. Any standard wood bit may be employed. Steel drills may be used with an adapter chuck.

Thrust of lead screw is carried directly to drill shank by a solid shaft. If necessary, any part can be readily replaced. Ratchet is fully inclosed in a strong semisteel head, providing protection against dirt. A long lead screw in combination with 1-, 2- and 8-in. extensions allows application of ratchet drill driver over a wide dimension range. Holes up to 3-in. dia have been drilled without difficulty. Although intended primarily for use on wood members, steel plates or beams can also be drilled by reducing the feed, which is done by revolving lead nut in same direction as drill. Manufactured by **Liberty Tool & Machine Co.** Distributed by **Dept P, Techtmann Industries, 714 W Wisconsin Ave, Milwaukee 1, Wis.**

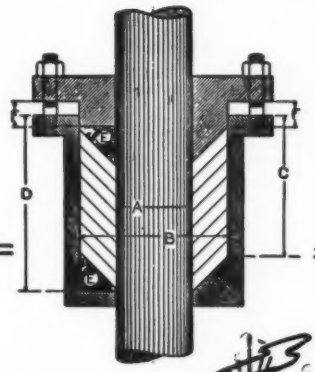
High-Pressure Feeder

CAPABLE OF FEEDING chemical solution against pressures up to 5000 psi, *DEL Wilson Pulsafeeder* has constant, adjustable feed rate. It incorporates horizontal direct-motor drive and positive displacement, reciprocating, diaphragm chemical proportioning pump. Reagent heads are constructed of corrosion-proof materials. Hydraulically balanced diaphragm is actuated by piston displacement through hydraulic fluid. Piston in cylinder is said to measure displacement accurately.

Micrometer adjustment by piston stroke permits selection of any flow rate from zero to maximum capacity of pump. Units are available with one reagent head for single feed or with two reagent heads for feeding two chemical solutions simultaneously. On duplex units, two heads can be adjusted while in operation, to uniformly synchronized flow rate or to varying flow rates. Five sizes



The Tougher the Service the Better the Proof . . . .



Self-Setting PACKING

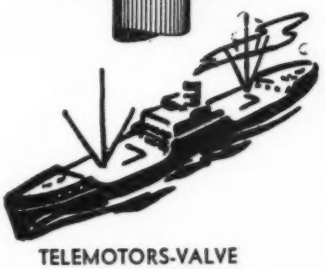
To use Q-P Self-Setting Packing is to play safe with those difficult applications which are frequently a source of trouble with ordinary packing, because Q-P is the packing especially designed for meeting tough operating conditions.

In turbine service, for example, Q-P has a long record of successful performance. Used by leading turbine builders in their equipment, operators have found it the packing to depend on for replacements, and for utmost assurance against shut-down.

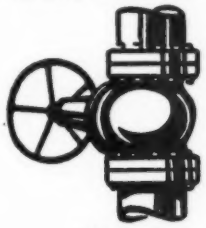
There are countless other performance-proved applications where Q-P Self-Setting Packing, once used, is fast becoming standardized on for both new equipment and for maintennace, because of its better performance, longer lasting qualities and less frequent attention. It is recommended for steam, water, compressed air, ammonia, fuel oils, gas, gasoline or oils.

The effectiveness of Q-P Packing is achieved through its unique features of design. In operation, the pressure of the fluid being handled deflects the edges of the packing rings in such a way as to form a perfect seal, automatically adjusting itself to exact rod diameter and reducing rod wear to a minimum.

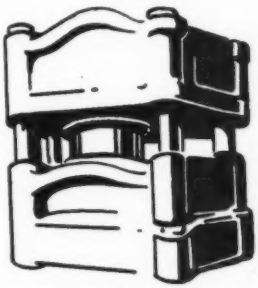
Outline your packing problem and let us show you how you can meet it most effectively with Q-P Self-Setting Packing.



TELEMOTORS-VALVE



VALVES



HYDRAULIC EQUIPMENT

Sales Representatives

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Chapman Industrial Supply Co., Los Angeles 13, Calif.
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Industrial Equipment Co., Charleston 23, West Va.
Kellogg Appliances Co., Philadelphia 44, Pa.
Kindred Appliances Co. Inc., New York 7, N. Y.
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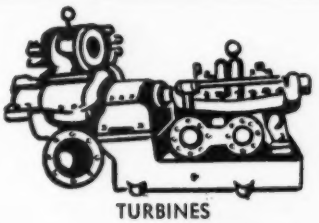
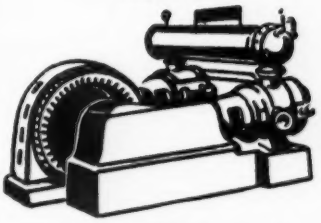
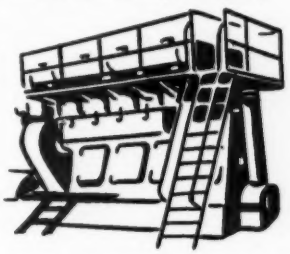


TURBINES



COMPRESSOR (Ammonia)



DIESELS

EXPANSION JOINTS

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Paramount Packing Co., Baltimore, Md.
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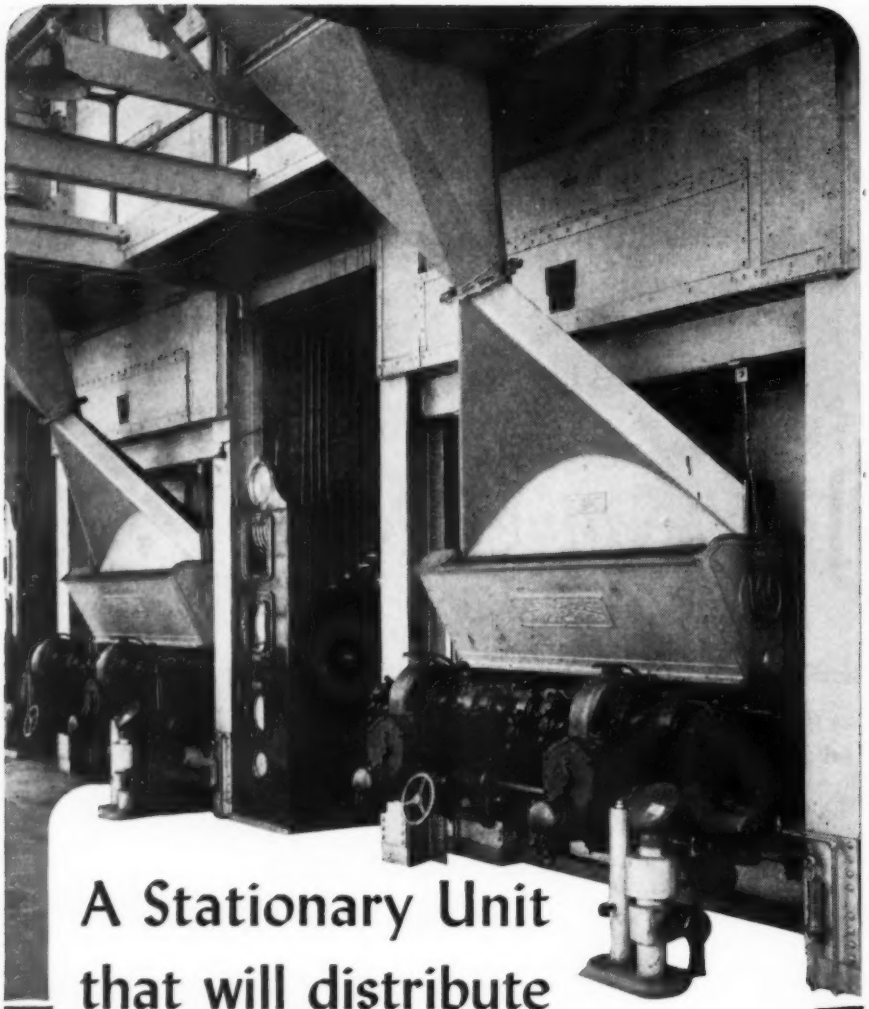
Peter J. Soulen, Milwaukee, Wis.
The Stephan Co., Cleveland 3, Ohio
Tutein Equip. Co., Pittsburgh 5, Pa.
Uhrich Supply Co., Kansas City 16, Mo.

The
Q-P MANUFACTURING COMPANY
NEEDHAM HEIGHTS, MASS.



A Stationary Unit that will distribute coal without segregation?

• It's the CONICAL shape of the coal distributing surface in S. E. Co. Coal Distributors that prevents segregation. By utilizing in the design of these distributors the natural law that causes particles dropped from the apex of a cone to distribute themselves evenly at its base, (regardless of variation in their size), we have produced a distributor that delivers a uniform mixture of coal to the stoker. This obviously means uniform combustion and reduction of grate and arch manitenance.

Yes! It's the S.E.Co. CONICAL Distributor

•

Write for engineering drawings and bulletins on the CONICAL Distributor.

Address inquiries to STOCK ENGINEERING CO.
715 HANNA BLDG.
CLEVELAND 15, OHIO

STOCK ENGINEERING CO.

★
CONICAL
Non-Segregating
Coal Distributors
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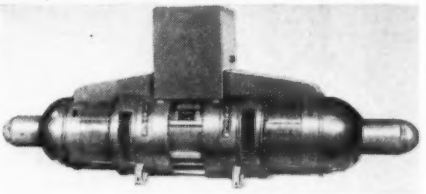
S.E.CO.
Coal Valves and Coal Scales

are available, with capacities ranging from a few cubic cm per hr to 10 gal per hr. **Dept P, Process Equipment Div, Lapp Insulator Co., 945 Margaret St, Le Roy, N. Y.**

Compound Water Meter

PITTSBURGH-EMPIRE compound water meter has a single register. This register records flows of both velocity and displacement measuring units through an over-riding clutch coordinator. Interior design includes a horizontally positioned propeller with shaft mounted on hard-rubber roller bearings and a full-opening swing-action valve with compensating linkage, providing a straight-through passageway for large volume flows. An *Empire* oscillating piston meter measures flow rates below accurate capacity of propeller unit. The compound meter, smaller and lighter in weight than previous compounds, is made in a complete size range. **Dept P, Pittsburgh Equitable Meter Co, 400 N Lexington Ave, Pittsburgh 8, Pa.**



Steel Arc-Welder

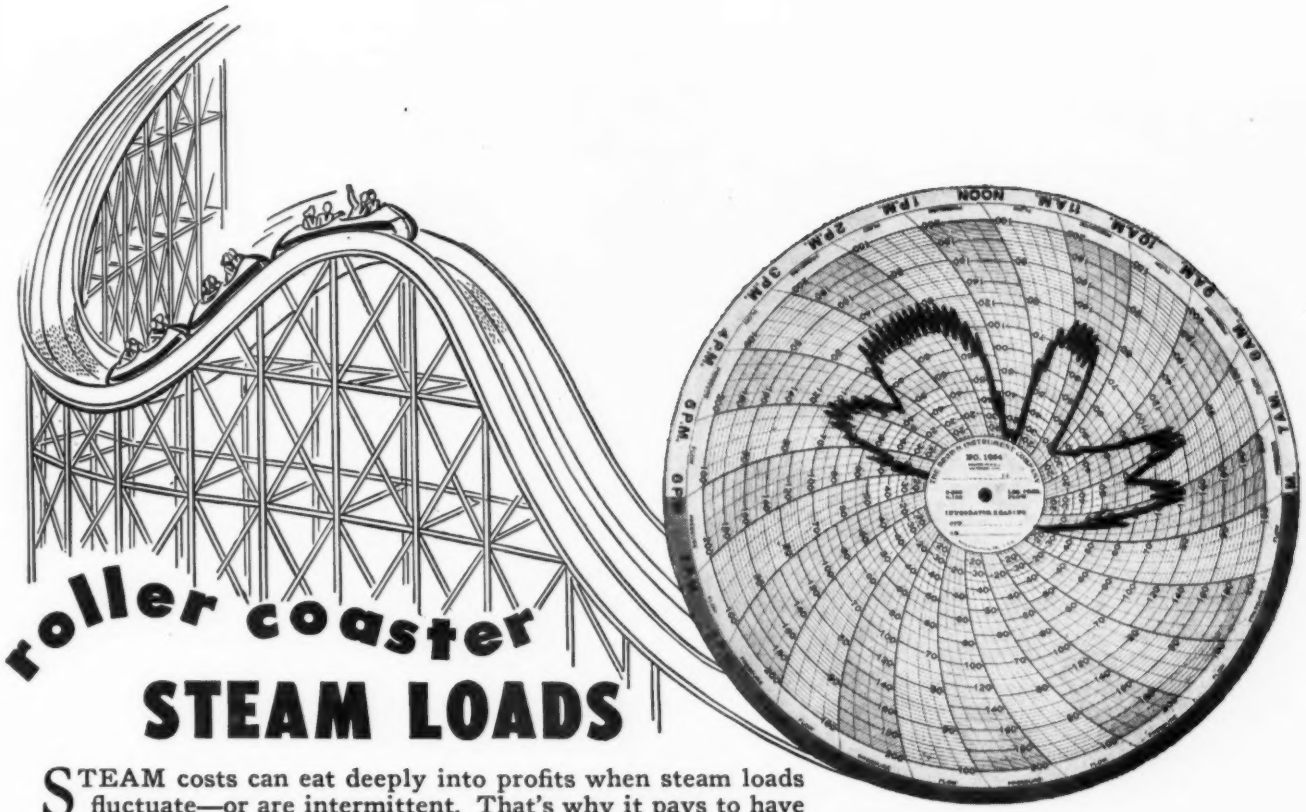
FOR RECENTLY INTRODUCED LINCOLNWELD process of automatic metallic shielded arc-welding, a new welder of 1200 amp comprises two 600-amp generators, close-coupled to an ac induction motor and equipped with complete motor control. Unit is of arc-welded steel, dripproof construction and is completely wired, ready for connection to ac power source and to *Lincolnweld* head of stationary, self-propelled carriage or tractor type.

Motor is of squirrel-cage induction design arranged for Y-Delta starting. Size of motor is ample for heavy overloads. Connection is for 220, 440 or 550 v, three or two phase, 60 or 50 cycles. Motor is protected by a special protective device operated by both temperature and current. Designated as SA-1200, this welder weighs 3200 lb and mounts easily by four feet, two on each side. **Dept P, Lincoln Electric Co, Cleveland 1, O.**

Steam Generators

FACTORY-ASSEMBLED BOILER sections, each independently fired and with all burners, auxiliaries and controls in place and connected, are now available as packaged steam plants. Drums, headers and brickwork have been eliminated. Compactness and light weight permit complete factory assembly before shipment. No special foundation, brickwork or customary stack is required for installation. Complete boiler need only be moved into place and connected to water, fuel, electrical and steam lines.

Current designs include high-pressure industrial and marine boilers using basic sections with a rated steam capacity of either 2500 or 5000 lb per hr at pressures to 1500



STEAM LOADS

STEAM costs can eat deeply into profits when steam loads fluctuate—or are intermittent. That's why it pays to have a steam plant designed to meet your steam loads most efficiently.

With a Cleaver-Brooks Steam Generator you are equipped for "roller-coaster" steam loads. Whether the demand is heavy or light—steady or variable—these custom-planned, sturdy, compact steam generators respond instantly and operate at a flat 80% efficiency with full or fluctuating load. A Cleaver-Brooks Steam Generator is thrifty with fuel at all times. Since it need not be "banked" during no load periods it saves this expense. Its low operating and maintenance costs, through the years, are established facts to many owners of Cleaver-Brooks steam generators. It will pay you to investigate—write for complete information.

CLEAVER-BROOKS COMPANY, 332 E. Keefe Ave., Milwaukee 12, Wisconsin

Custom-planned —

Every Cleaver-Brooks Steam Generator is built to the measure of an individual plant's needs, and Cleaver-Brooks assumes full responsibility for the satisfactory selection and initial operation of the unit.

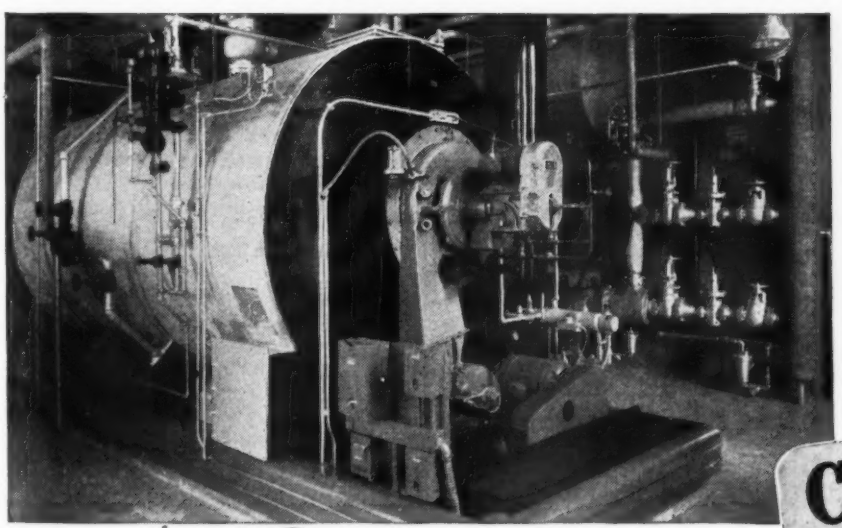
A qualified engineer analyzes load conditions, space and machinery arrangements. After installation, a factory engineer puts the steam generator into operation and trains plant employees on its operation, care and maintenance.

Self-contained and "packaged"

Delivery consists of a "packaged" unit. Connections to service outlets are all that is needed. No smokestack is used — a simple vent carries away all products of combustion. No extra foundation is required. Compact — the unit fits into limited space and low headroom locations. Sizes: 22 models — 15 to 500 hp; pressures 15 to 200 lbs. p.s.i.

Money-making performance—

The Cleaver-Brooks Steam Generator is designed for easy operation and low upkeep cost. Operation is at 80% efficiency from full load down to 30% of its rating. The high heat transfer from the 4-pass, down-draft boiler produces fast steaming. A boiler room as clean as the home or office is possible through use of oil for fuel



WRITE on your business letterhead for the Free Steam Cost-Calculator — a ready-reference slide rule showing the comparative steam costs when using oil or coal as fuel.

Cleaver-Brooks
STEAM GENERATORS

FOR COMPLETELY AUTOMATIC AND DEPENDABLE VOLTAGE REGULATION

Burlington Synchrostat
(REG U.S. PAT. OFF.)
VOLTAGE REGULATOR

The Burlington Synchrostat, Type SR, Model SF, has proven to be the answer to the problem of voltage regulation in numerous installations. Its inherent sensitivity in following voltage changes makes it respond quickly and accurately in restoring generator voltage to normal.

SPECIAL FEATURES ARE:

Simplified control . . . rugged construction . . . simple installation . . . minimum maintenance . . . unaffected by reasonable vibration . . . automatic polarity reversal . . . rapid, positive response to maintain normal voltage.

Write today for full particulars **and** application data.

BURLINGTON INSTRUMENT CO.
707 FOURTH STREET BURLINGTON, IOWA

PANEL INSTRUMENTS • VOLTAGE REGULATORS • AUTOMATIC SYNCHRONIZERS • FREQUENCY REGULATORS

B

psi and temperatures to 850 F; low-pressure power and process boilers in six models rated at 5000- to 30,000-lb steam capacity per hr at 200-psi maximum pressure; and test boilers with rated steam capacity of 2500 lb per hr at 1500 psi. **Dept P, Besler Corp, Emeryville 8, Calif.**

Vibration Isolation

TYPE LK, a simplified steel-spring vibration-isolating unit, is designed in 26 sizes for rated loads of 75 to 12,000 lb. Adjustable resilient chocks in the four corners of housing act as stabilizers. Type *LK* provides efficient vibration control for all impact machinery, stationary and marine diesel engines, generators, panelboards, material testing and processing equipment, ventilating and air-conditioning equipment, recording apparatus, etc. **Dept P, Korfund Co, 48-15 32nd Pl, Long Island City 1, N. Y.**

Control Valve

NEW 125-LB SINGLE-VANE quick-operating control valve transfers chemicals, oil, paper, pulp, sewage, water and other materials from one line to another. This 4-way transfer valve can be manually or automatically operated. It is available for a wide range in pressure together with sub-zero and elevated temperatures. It is equipped with adjustable stop screws and indicator to determine vane position. Valve can be fabricated from all metals in sizes from 4 to 72 in.

This valve is constructed of R-S *A* metal, a tough, dense metal of uniform grain and high endurance limit, according to maker. It is a metal of engineered construction to replace steel. **Dept P, R-S Products Corp, Wayne Junction, Philadelphia 44, Pa.**

Lifting Bar

ONE MAN CAN LIFT as much as a 5-ton load with new lifting bar. It has a hardened steel roller for extra leverage and ledges for safe gripping. It is furnished with three styles of interchangeable toe plates: notched, for prying up spikes and lag bolts and getting under heads and corners; straight-edged, for lifting and moving; straight-edged with rubber coating, to prevent scratching of surfaces with enamel or other finish. There are two sizes: 5-ton capacity and 1-ton size. It serves for relocating machinery. **Dept P, Arnolt Motor Co, Warsaw, Ind.**

Tension Wrench

NEW T-TYPE TORQOMETER offers definite advantages for specific operations where working space is limited. This torque wrench is for all big nut-tensioning operations requiring tensions up to 2000 ftlb. It serves either as a double- or single-handle tool. The two handles provided can be securely locked to the main unit or quickly and easily removed as required.

Large 4-in. dial and pointer are both adjustable to the position giving easiest readability. An additional convenience is the flash signal that lights when exact required tension is reached, contributing to accurate application of tool when working under poor lighting conditions. *Torqometer*, complete

COMPACT

BALANCED

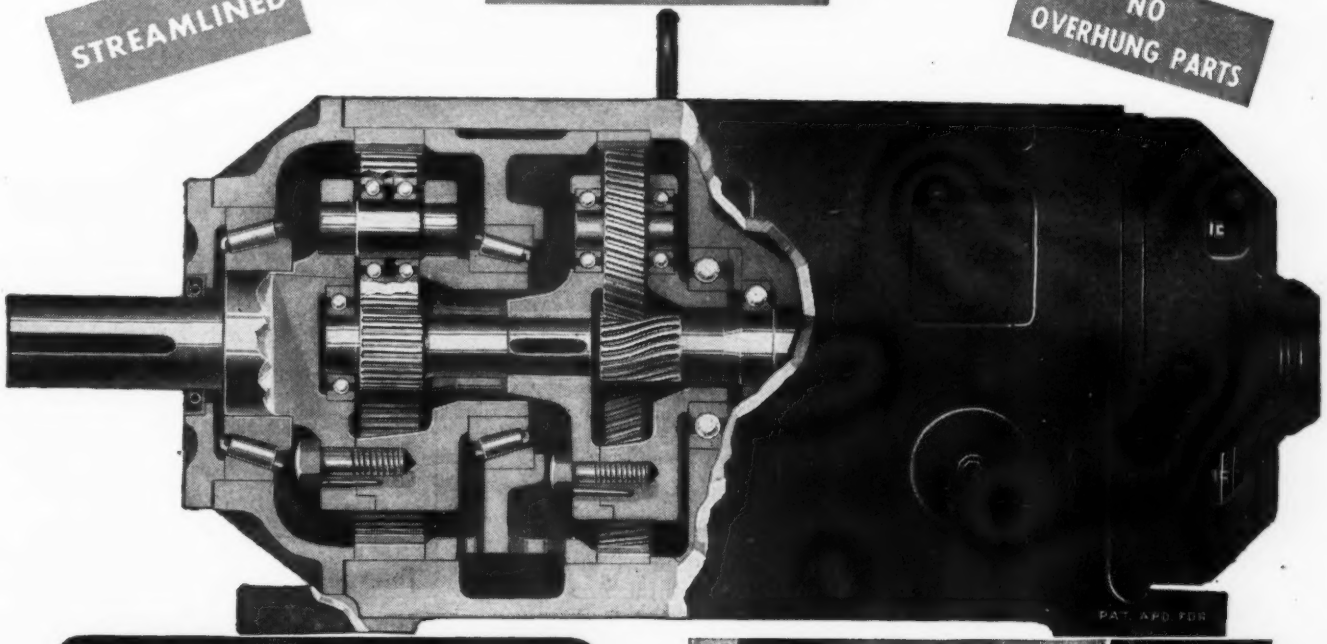
VIBRATIONLESS

EFFICIENT

STREAMLINED

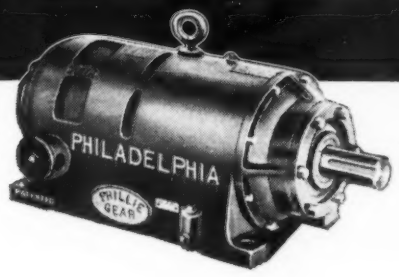
THOUSANDS USED

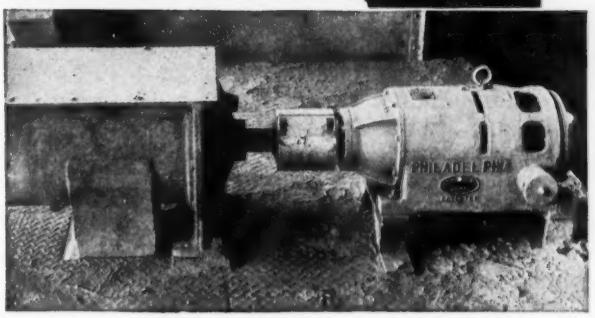
NO OVERHUNG PARTS



Philadelphia

MOTOREDUCER





Above: A type HD, 1½ Horsepower *MotoReduceR* driving a Screw Conveyor in a large refractories plant. Motor Speed 1750; output speed 33 R.P.M.

Here's the ideal combination of a high grade motor and an efficient Planetary Speed Reducer, *most compactly arranged in one housing*—a self-contained Speed Reducing Unit with *no overhanging parts*—a Unit that is vibrationless, smooth-running, sturdy, and dependable—that requires no base plate or couplings between motor and geared reducer—a Unit that assures proper tooth alignment at all loads—that "blends" with, and appears to be, an integral part of the machine on which it is installed—a Unit that is impervious to dust, dirt, moisture and fumes—and might we add, a Unit that runs noiselessly and lasts for years and years, with little or no upkeep costs.

The Philadelphia *MotoReduceR* is available in both Horizontal and Vertical types—in all standard A.G.M.A. Ratings. Send for 52 page catalog, #MR-45.

Philadelphia

GEAR WORKS INCORPORATED

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO . . . IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

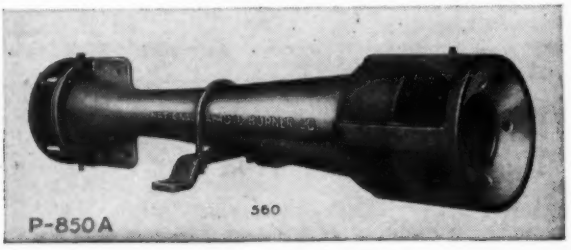
Industrial Gears and Speed Reducers
LimiTorque Valve Controls

"AIROCOOL" GAS BURNERS

CONSUME RESIDUE GAS . . . AND HELP PRODUCE HIGH OCTANE GASOLINE AND OTHER REFINERY PRODUCTS

NATIONAL AIROIL BURNERS

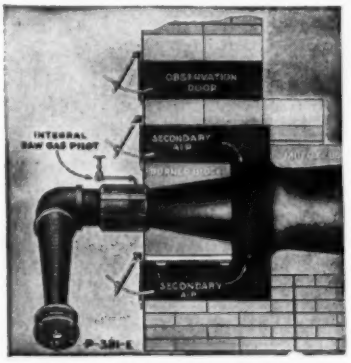
for FUEL OIL
. . . for GAS



The "Airocool" is a high capacity, venturi inspirating gas burner many of which are used in well known refineries in combination with our Tandem Block Combustion Unit. When equipped with our "Airocool" flame stabilization nozzle, they permit a wide turndown ratio. The "Airocool" gas burner gives efficient results throughout the operating range.

"AIROCOOL" NOZZLE

"Airocool" nozzles have a recessed facing of refractory insulating plastic, which affords protection against extreme radiant heat. This design prolongs nozzle life without employing expensive heat resisting alloys in their manufacture. Igniter ports have renewable type recessed gas tips, inserted to direct the igniter flames against the main volume of mixture and thus assure stability of ignition. It also prevents overheating and burning of casting and allows greater turndown without burnback.



TANDEM BLOCK COMBUSTION UNIT

Tandem Block Combustion Units control flame position accurately and positively with resulting economy of fuel. Combustion is efficient with a minimum of excess air and the shortest possible flame. These units can be equipped with combination oil and "Airocool" gas burners, and will perform equally well with either fuel. Quick change made from one fuel to the other without alteration to equipment.

Sign and mail the coupon. Get our Bulletin #4 with detailed information concerning the "Airocool" and its possibilities.

NATIONAL AIROIL BURNER

National Airoil Burner Company, Inc.
1250 East Sedgley Avenue
Philadelphia 34, Pa.
Gentlemen:
Please send me your "Airocool" gas burner Bulletin #4.

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ADDRESS .....

CITY ..... STATE.....

NAME .....TITLE.....

NATIONAL AIROIL BURNER Company, Incorporated

1250 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PENNA.

Texas Office: 2nd National Bank Bldg., Houston

OIL BURNERS • GAS BURNERS • GAS PILOTS • PUMP SETS • EXPLOSION DOORS
ACCESS DOORS • AIR DOORS • BURNER BLOCKS • FURNACE OBSERVATION WINDOWS

with two handles, weighs 30 lb. All exterior parts of tool have gun-metal finish. Any socket wrench having a 1-in.-sq drive may be used with this model. **Dept P, Snap-on Tools, Kenosha, Wis.**

Bubbleless Oil

ANTIFOAM AGENT reduces tendency of lubricating oil to form bubbles under churning action of crankshafts and bearings. It is designed to keep oil in a fluid state. Agent breaks bubbles by reducing surface tension of oil. **Dept P, Gulf Oil Corp, Pittsburgh 30, Pa.**

Conical Thrust Bearings

DESIGN is such that the apex of cone formed by the rollers meets at true center of bearing. This permits rollers to align themselves between tapered faces and outside rib of raceways. High speeds are easily handled. Conical-roller thrust bearings carry thrust loads only. Mounting should be designed to avoid radial load. Conical-roller bearings from 9⅞ in. OD to 19½ in. OD and load capacity up to 440,000 lb are available. **Dept P, Kaydon Engrg Co, Muskegon, Mich.**

Hydraulic Electric Switch

IN THIS UNIT, hydraulic valve that actuates switch is a self-contained cartridge that is renewable and interchangeable. An externally operated screen allows close adjustment without breaking line. With two different spring cartridges, entire operating range of 100 to 3200 psi is covered. Switch body is available in bronze or aluminum. The dc switch is a single-pole, single-throw, normally closed design with dc rating, 40-amp 28-v inductive load; 17-amp 125-v and 8½-amp 250-v noninductive load. **Dept P, Merit Engineering, Inc, 40 Clifford St, Providence, R. I.**

Adjustable T-Square

MOLDED OF HEAVY, COLORFUL plastic, a new streamlined adjustable T-square features a protractor graduated in degrees. Another feature is that arms of 12, 18, 24 and 30 in. are interchangeable. The arm permits clear visibility over entire surface of the work and is so fastened to the head as to pivot to any angle. It is equipped with brass lugs for ink ruling. **Dept P, C-Thru Ruler Co, 385 Capitol Ave, Hartford, Conn.**

Hard-Metal Drill

IMPROVED METAL disintegrator removes broken taps and drills from work in progress. This Model 3 metal disintegrator works on electrical sputtering principle and is suitable for drilling hard metals.

Three models of the machine are available: Completely self-contained Models A and B are floor models and can be rolled to any part of the plant. Model C is a portable, table, or bench model, consisting of controls, transformer, coolant tank, pump and working head in a unit.

Reduction in size of head components per-

(*Continued on page* 176)

Stop This Waste

for

GREATER FREEDOM FROM LEAKS

INSTALL LADISH Forged Steel Fittings

Drop Forged fittings provide longer life and increased endurance. Greater metal soundness, finer grain structure and increased strength result from the high impact pressures inherent in the Drop Forging process.

Added resistance to the shocks, strains and stresses . . . imposed by pressure, temperature, vibration, expansion and contraction . . . is obtained by using forged steel fittings. Ladish Controlled Quality Forged Steel Fittings provide additional advantages of thorough metallurgical control and close inspection of physical dimensions.

Controlled Quality

FITTINGS DIVISION

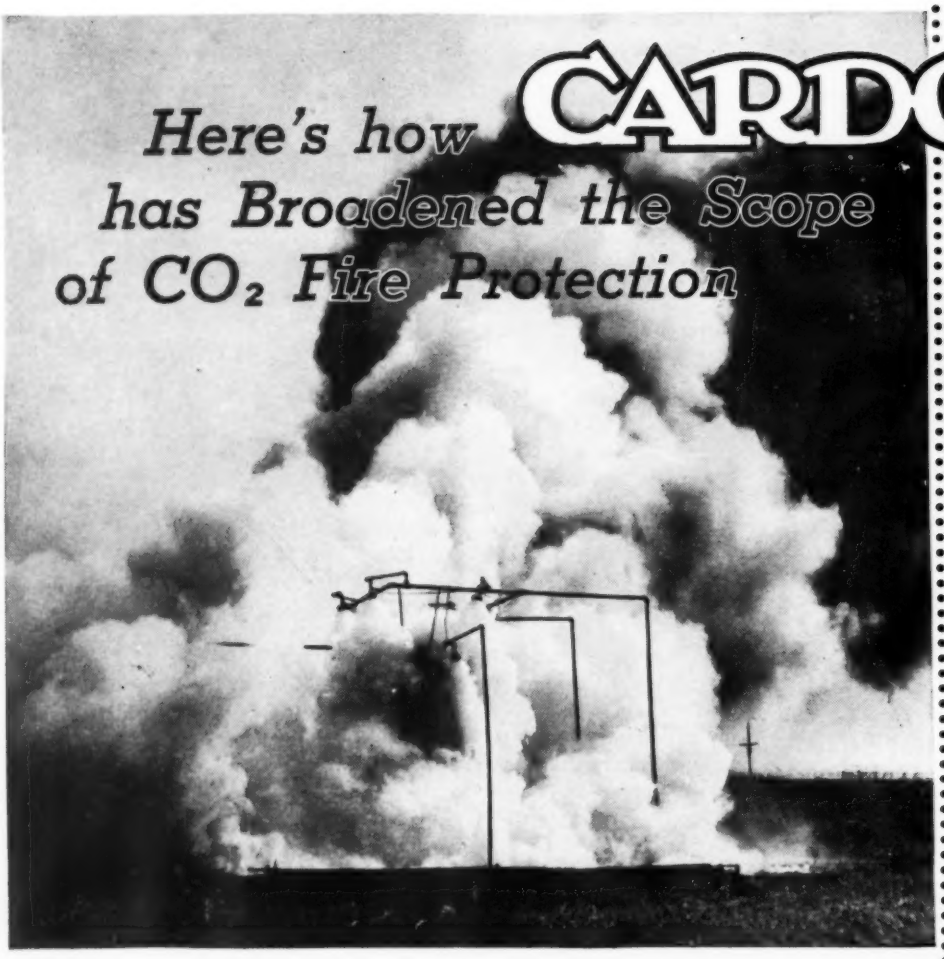
LADISH DROP FORGE CO.

CUDAHY • WISCONSIN (MILWAUKEE SUBURB)

District Offices: NEW YORK • BUFFALO • PITTSBURGH • CLEVELAND • ST. LOUIS • HOUSTON • NEW ORLEANS • LOS ANGELES

TO MARK PROGRESS

Here's how CARDOX has Broadened the Scope of CO_2 Fire Protection



Carbon dioxide has, of course, long been recognized as one of the fastest, most effective fire fighting agents. Its advantages as a non-damaging extinguishing medium, with no clean-up mess or time loss, give it an important plus value in many industries and situations.

The problem has been to make this dry, inert gas practicably available in fire fighting equipment equally capable of protecting small, multiple or very large hazards.

Cardox Fire Fighting Equipment . . . using its own unique methods of engineered control and application . . . has multiplied the applications of carbon dioxide as a fire fighting medium.

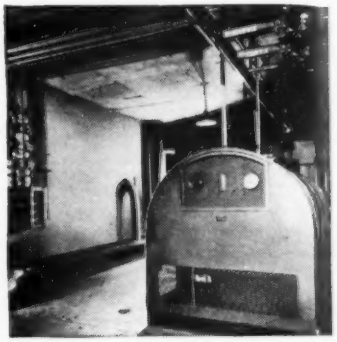
As a result of these distinctive Cardox developments, *low pressure* liquid carbon dioxide can be applied with equal facility in *pounds* or *tons* . . . making it entirely practical to use this fast, non-damaging medium (1) To protect banks of large transformers outdoors, (2) To provide tons of Cardox CO_2 on a high speed truck to guard widely scattered hazards, (3) To overwhelm vicious airplane crash fires fast anywhere on large airfields . . . making possible speedy rescue of plane personnel and salvage of costly equipment, (4) To provide a *single system* capable of protecting multiple hazards throughout large plants, (5) To equip factories, hangars, etc. with a *portable unit* with sufficient wallop to deal with relatively large fires *when seconds pay dividends.* All Cardox Fire Fighting Equipment has one characteristic:

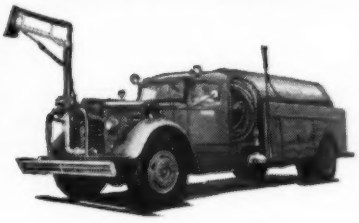
The distinctive Cardox method of control and engineered application of carbon dioxide, stored at 0°F. and 300 p.s.i. in a single storage unit containing from ¼ to 125 tons of fire-destroying Cardox CO_2 . . . enough to handle even large fires and leave an ample reserve for new emergencies.

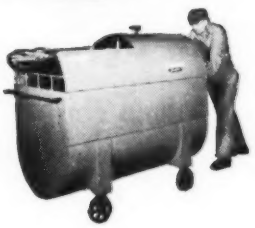
As a result of the removal of former limitations to the use of carbon dioxide by Cardox control and application, Cardox Fire Extinguishing Equipment can be engineered to provide protection for hazards indoors or out. We should welcome the opportunity of helping you evaluate accurately the place of Cardox Broadened CO_2 protection in your specific operation. *Write for Bulletin No. 966.*

CARDOX CORPORATION
BELL BUILDING • CHICAGO 1, ILLINOIS
District Offices in
New York • Philadelphia • Washington • Pittsburgh
Cleveland • Detroit • Cincinnati • Houston
San Francisco • Los Angeles • San Diego

Typical Examples of Cardox Fire Fighting Equipment

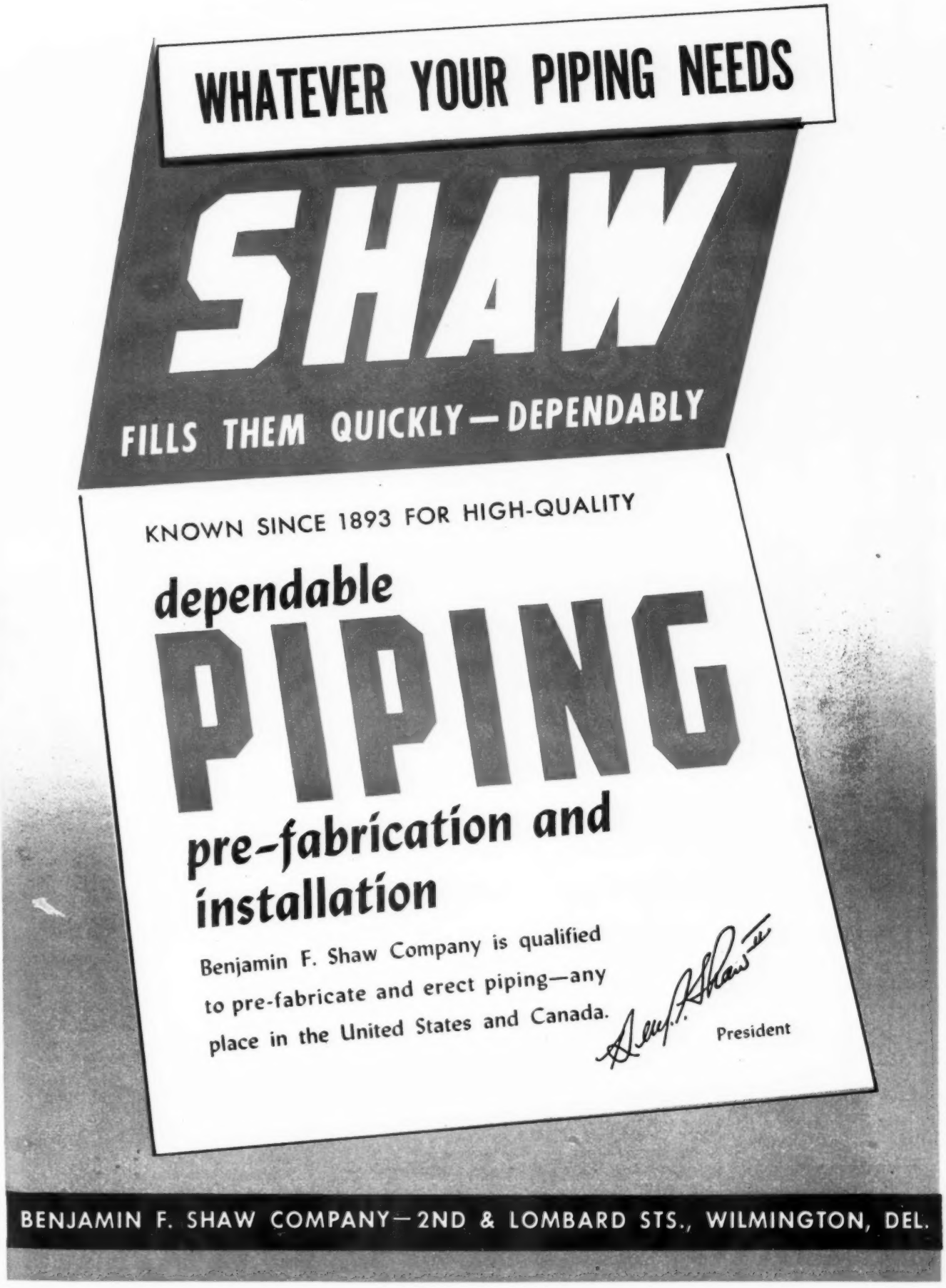






(1) Cardox Fixed Systems. Provide 500 pounds to 125 tons of liquid carbon dioxide. **(2) Cardox Fire Trucks.** Tons of CO_2 on wheels for application through hose lines or standpipe systems. **(3) Cardox Airport Fire Truck.** Uses mass attack to overwhelm vicious crash fires fast. **(4) Cardox Transitank.** Portable unit with a capacity of 750 pounds of carbon dioxide. Now available in certain parts of the country in hand propelled, and motorized models.

CARDOX
CO_2 FIRE EXTINGUISHING SYSTEMS


WHATEVER YOUR PIPING NEEDS
SHAW
FILLS THEM QUICKLY—DEPENDABLY
KNOWN SINCE 1893 FOR HIGH-QUALITY
dependable
PIPING
pre-fabrication and
installation
Benjamin F. Shaw Company is qualified
to pre-fabricate and erect piping—any
place in the United States and Canada.
President
BENJAMIN F. SHAW COMPANY—2ND & LOMBARD STS., WILMINGTON, DEL.

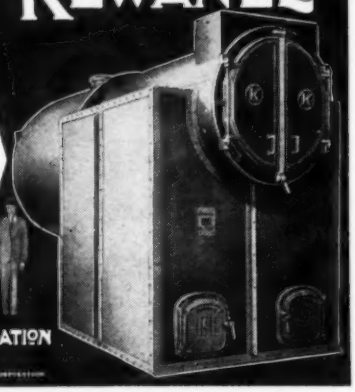
Hi-Test KEWANEE

FOR POWER and PROCESS STEAM

6 Sizes for 50 to 150 H. P., 125 and 150 lbs. W. P....a quick steaming all-welded portable type with refractory lined fire-box to save fuel.

75 Years Boilermakers

WRITE DEPT. 89-K6 for 6" scale with pipe diameter markings.



WON FOR 5th TIME

KEWANEE BOILER CORPORATION
KEWANEE, ILLINOIS

Gauge Glasses TESTED for Pressure

One way to get trouble-free service out of your Gauge Glasses is to select the right glass for your particular service. For instance if you use the pressure table as a guide, you can be sure your Gauge Glasses will stand up in service. Actual routine tests prove that Pyrex and Corning Gauge Glasses will withstand pressures in excess of those recommended.

Machine drawn accuracy permits ease of installation and minimizes breakage. Resistant to the solvent action of hot water and steam, the hard, smooth surface of the glass also resists abrasion. These are some of the important features that add to the life and economy of Pyrex and Corning Gauge Glasses. Corning Glass Works, Corning, New York.

"PYREX" and "CORNING" are registered trade-marks and indicate manufacture by Corning Glass Works, Corning, N. Y.

CORNING Glass Works Corning, New York

Pyrex Gauge Glasses BRAND

mits use of Drafto disintegrator in inclosed spaces. As principle of operation generates heat only in a restricted area, device is suitable for extracting broken taps from iron castings. Round, hexagonal and square electrodes, or special shapes are available for drilling with the disintegrator.

Electrodes available range in size from 0.065 in. to 0.310 in. dia; square electrodes up to ½ in. Stock electrodes are round, hexagonal and square. Special shapes are furnished on request. **Dept P, Drafto Corp. Cochranton, Pa.**

Exhaust Systems

DE LUXE CLEAR-EX (clear exhaust) is a simple automatic air valve that introduces air into the exhaust system of internal-combustion engines. Attached to exhaust manifold, it operates by utilizing vacuum that exists in exhaust system. It clears the burnt gases remaining in the combustion chambers after the exhaust stroke and replaces those gases with fresh air. Usually two of the valves are installed in the exhaust manifold system in holes to be tapped for the purpose. **Dept P, De Luxe Products Corp, La Porte, Ind.**

Safety Lifting Clamp

TWO DEFINITE clamping principles are found in new *Volz* flat-surface lifting clamp—one a pressure grip, the other a wedge grip. Any plate, container, assembly, etc, may be lifted provided it has sufficient flat surface to engage clamp jaws. All working parts are in a strong drop-forged casing. One jaw is actuated on a cantilever basic principle; the specially constructed stationary jaw is said to give tremendous wedge power and grip. The clamp, in ½-, 1-, 3- and 6-ton capacities, takes from 0 to 2 in. in thickness. **Dept P, Merill Brothers, 46-18 Arnold Ave. Maspeth, L. I., N. Y.**

Safety Gauntlet Cuff

JOMAC GAUNTLET CUFF is a separate piece for gauntlet-style industrial gloves. It is an extra strong covering for the forearm. When gloves become worn they may be replaced, the gauntlet cuff being retained. Cuff fits snugly at wrist around the glove. **Dept P, C Walker Jones, Philadelphia 38, Pa.**

Siding and Roofing Material

PLASTIPITCH-TREATED METAL, for roofing and siding on industrial buildings, consists of flat, corrugated or V-crimp steel sheets, the surfaces and edges of which have been treated with the compound. It is claimed to provide permanent adherence to metal at low as well as high atmospheric temperatures and to protect the base from rusting, corrosion, salt air and effects of chemical fumes.

After coating, sheets are provided with additional surfaces to give added protection. Besides roofing and siding, material is suitable for gutters, ventilators, flashing, ducts and similar applications. The sheets can be fabricated without special equipment, and bent without impairing the coating. They do not require further painting. **Dept P, Tar & Chemical Div, Koppers Co, Pittsburgh, Pa.**

Wire ahead for Full Production

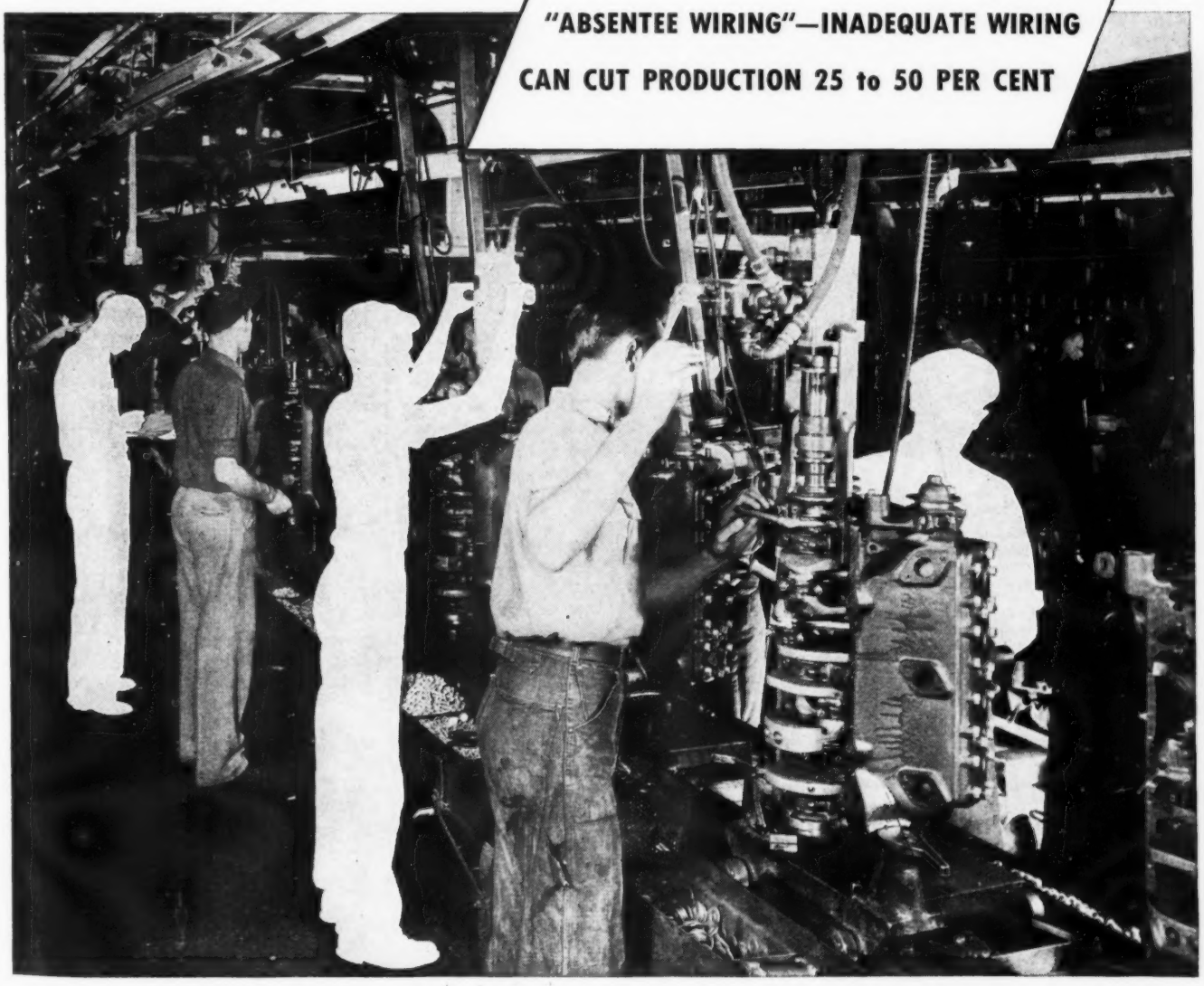
A FULL CREW, on full pay *ought* to mean full production. But the most conscientious workers can't maintain schedules on power-starved machines.

And plant surveys show that obsolete, overtaxed wiring can reduce machine and man power efficiency from 25 to 50 per cent.

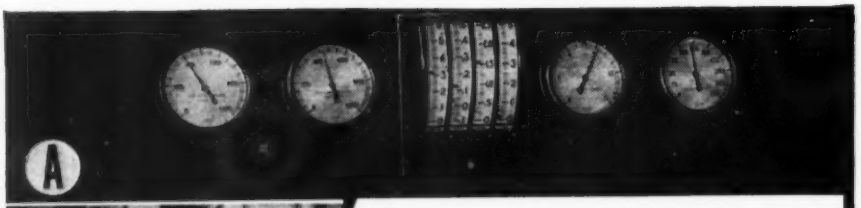
By all means make certain your wiring will support your production plans. Check the problem with your plant power engineer, your consulting engineer, electrical contractor or power salesman.

Low-cost electric power, all you want of it, is on the other side of the meter. Make sure it gets where it's needed, to safeguard high-priced man power. 46319

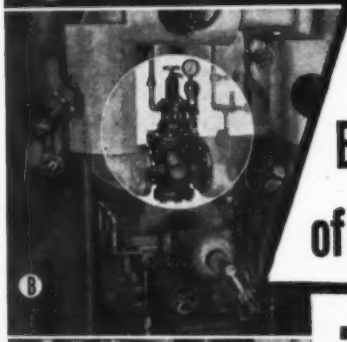
"ABSENTEE WIRING"—INADEQUATE WIRING CAN CUT PRODUCTION 25 to 50 PER CENT

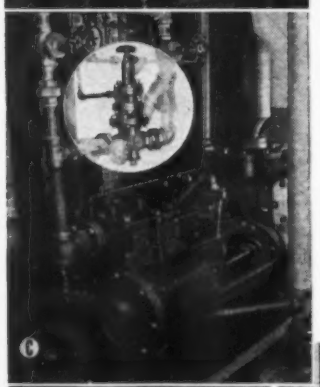


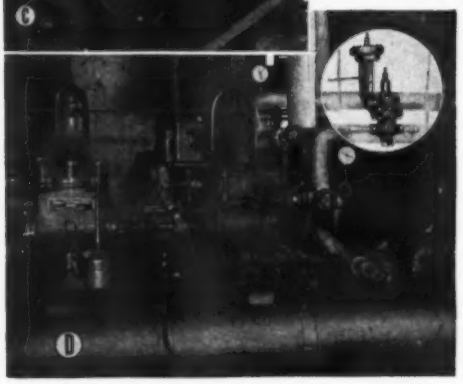
ANACONDA **ANACONDA WIRE & CABLE COMPANY**



DOES YOUR OPERATING BOARD SHOW THIS PICTURE of AUTOMATIC CONTROL?







These operating board gages in the power plant of Beattie Manufacturing Company, makers of Axminster, Velvet and Wilton Rugs, Little Falls, N. J., tell a real "behind-the-scenes" story of steam power automatically controlled to extremely close limits regardless of load variations.

The second gage, recording boiler feed water pressure shows 470 lbs. set pressure maintained by a LESLIE Pump Governor which completely controls operation of turbine-driven feed pump. Third gage indicates efficient operation of a LESLIE Pressure Controller working instantly to make up any deficiencies in low pressure heating system. This make-up steam is taken from 125-lb. system and controlled so that pressure is held accurately at 9 psi.

The steady needle pointer on fourth gage shows process steam reduced to 120-lbs. by a LESLIE Pressure Controller from 400-lbs. initial boiler pressure, shown on first gage.

The real reason for this extreme accuracy of control lies in LESLIE'S policy of only building better regulators — giving extra features such as stellited valve seats, surface hardened stainless steel valves and heat-treated stainless steel cylinder liners with highly ground finish—*all as standard equipment which guarantees positive dead-end service and close regulation.*

Investigate today the savings which LESLIE Regulators make possible. Write for LESLIE Catalog of Engineering Data.

LESLIE

(A) Section of Operating Board in Power Plant of Beattie Manufacturing Co.

(B) LESLIE Class PTH Pump Governor on Turbine Driven Feed Pump maintaining constant feed water pressure to boilers.

(C) LESLIE Class PRH Pump Governor on Reciprocating Pump maintaining constant water pressure in Beattie Dye House.

(D) LESLIE Class LTCO Temperature Regulator in Beattie boiler room controlling temperature of fuel oil to burners and holding within ±2 under all load conditions.

LESLIE CO.

255 Grant Avenue, Lyndhurst, N. J.

Look for "LESLIE Regulators" in your classified telephone directory in these cities, for LESLIE factory-trained engineers to help you with your regulation problems:

Baltimore, Md.	Milwaukee, Wis.	San Francisco, Cal.
Boston, Mass.	Montreal, Que., Can.	Savannah, Ga.
Bridgeport, Conn.	New Orleans, La.	Seattle, Wash.
Chicago, Ill.	New York, N. Y.	St. Louis, Mo.
Cleveland, Ohio	Philadelphia, Pa.	Syracuse, N. Y.
Dallas, Tex.	Pittsburgh, Pa.	Toronto, Ont., Can.
Detroit, Mich.	Portland, Ore.	Troy, N. Y.
Greenville, S. C.	Providence, R. I.	Tulsa, Okla.
Houston, Tex.	Richmond, Va.	Vancouver, B.C., Can.
Kansas City, Mo.	Rochester, N. Y.	Wilkes-Barre, Pa.
Los Angeles, Cal.	Rutherford, N. J.	Youngstown, Ohio
Louisville, Ky.	San Antonio, Tex.	

ESTABLISHED 1900

LESLIE CO.

PRESSURE REDUCING VALVES · PUMP GOVERNORS · PRESSURE CONTROLLERS
TEMPERATURE REGULATORS · SELF CLEANING STRAINERS · LESLIE-TYFON WHISTLES

Power News

(*Continued from page* 134)

the vertical motion of both target ships and buoys at various distances from the bomb. Recorders on the ocean bottom will draw time-pressure curves.

P W Swain, editor of POWER, will report the atom-bomb test for POWER and all other McGraw-Hill publications. He will sail from San Francisco for Bikini June 12 and will return late in the summer.

Earle Mauldin of Atlanta, Ga., has been appointed Southern editor of POWER, with headquarters at the McGraw-Hill office, 1011 Rhodes-Haverty Bldg. Mr Mauldin will contact Southern industrial establishments for POWER, as well as for three other McGraw-Hill publications: *Textile World, Chemical & Metallurgical Engineering* and *Food Industries.* He is a graduate of Furman University, a member of the American Society of Mechanical Engineers and of the Illuminating Engineering Society, president of Georgia Engineering Society, registered engineer, Ga. and S. C. Associated 18 years with J E Sirrine & Co, of Greenville, S. C., he has been identified for over 30 years with Southern industries.

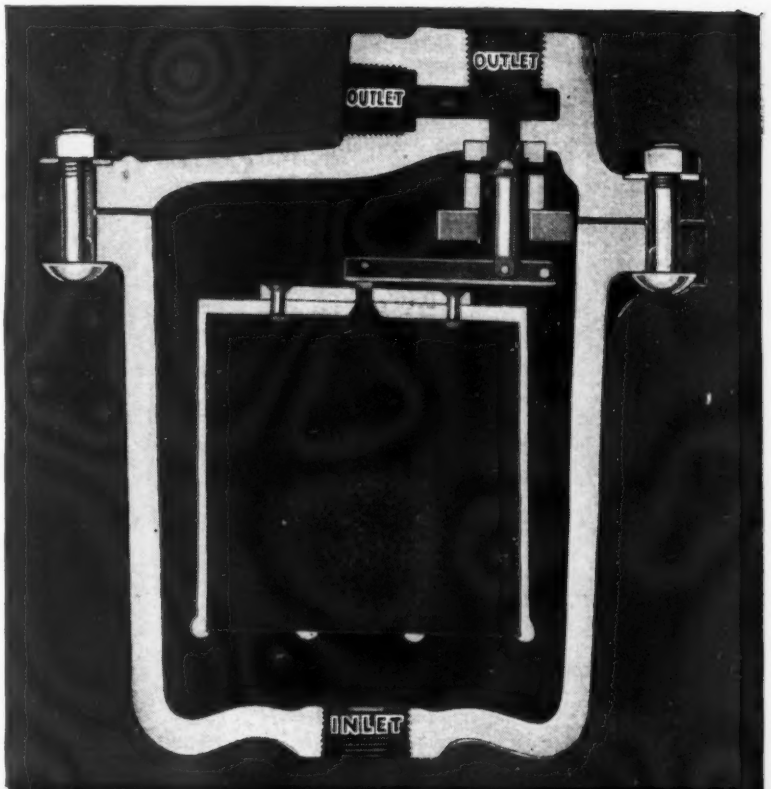
One of the largest stationary boiler orders ever to be placed in this country, valued at nearly $5,000,000, has been received by Foster Wheeler Corp. The steam generators have been ordered by Pennsylvania Power & Light Co for its new 150,000-kw steam-electric station scheduled to be completed at Sunbury, Pa, in spring of 1948. The order, covering four steam generators, calls for the largest boilers ever designed for direct firing with pulverized anthracite. Each of the units will be capable of producing 400,000 lb of steam per hr at 1350 psi and at 955 F.

Paul B Huyette Co of Philadelphia and New York is celebrating its 50th year. Founded in 1896 by the late Paul B Huyette, as factory representative for several manufacturers, the organization has grown through the years until now the representation includes eleven manufacturers. In addition the company manufactures its own line of gages, valves, cocks, tools, funnels, etc. Paul B Huyette's son, S Louis Huyette, is now president of the concern.

Efficiency.

Wherever you use steam, air or gas, Clark Fluid Controls will save money by increasing the efficiency of equipment and prolonging equipment life!

That's a *promise* backed by *performance* . . . by **37 Years** of performance during which Fluid Controls designed, manufactured and backed by Clark have always kept every promise made for them.



The popular CLARK SERIES 80 Inverted Bucket Type Steam Traps with Clark Patented Bucket Venting Device and other exclusive Clark features. Available in 6 sizes, ½" to 2½", for pressures up to 250 P.S.I. and temperatures to 450° F. Write for free catalog for complete specifications and applications of the wide line of Clark Fluid Controls.

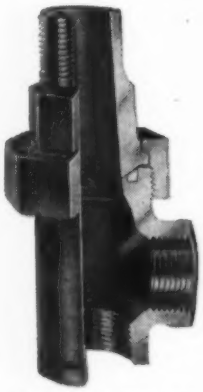
Clark
FLUID CONTROLS

THE CLARK MANUFACTURING COMPANY · DEPT. A · CLEVELAND 14, OHIO

Makers of a wide line of fluid controls including

STEAM AND FLUID TRAPS	STRAINERS	PRESSURE REGULATORS
VACUUM AND LIFTING TRAPS	VALVES	REDUCING VALVES

JEFFERSON



Jefferson Union Tee, with Male-Female connections, and with Union on the outlet.

SPECIALTY UNIONS
with the RECESSED BRASS SEAT

Provide the means for BETTER, TIGHTER piping installations

Leak-proof tightness is obtained in all Jefferson Unions by a patented brass seating feature which provides a true ball joint. Location of this seat is such as to assure free flow through the fitting. Furthermore, any possibility of the screwed end of the pipe coming in contact with the seating ring, regardless of how far the pipe is screwed in, is eliminated. The Specialty Union shown here is one of several in the complete Jefferson line which includes 90° and 45° Elbows as well as Union Tees with union on the run and with union on the outlet.

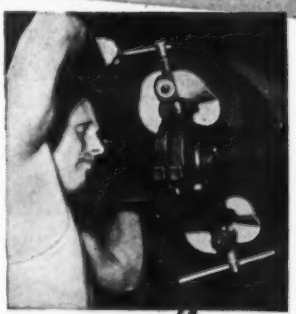
The completeness of the Jefferson line vastly simplifies piping problems and makes better piping installations possible. Ask your nearest distributor for details or write us direct.

JEFFERSON UNION CO.

601 West 26th St — New York 1, N. Y.

LEXINGTON 73, MASS. — LOCKPORT, N. Y.

FLANGE JACKS



...for safe, easy and fast gasket replacement!

Operating with a minimum of effort — vital in tight, cramped quarters — FLANGE JACKS exert tremendous pressure smoothly and evenly. There is no shock along the pipe line, bolt holes are maintained in perfect alignment, and flange faces cannot be damaged. FLANGE JACKS eliminate long costly shut-downs.

MAXIMUM PROTECTION to personnel and plant!

FLANGE JACKS are vital when replacing gaskets in presence of oil or gas fumes . . . eliminates hammer blows and sparks. FLANGE JACKS are a "must" in safety engineer specifications.

TAKES A FRACTION OF THE USUAL TIME!

Detailed information concerning this exclusive tool will be sent promptly on request. Write Dept. E. or contact your nearest distributor.

T. G. PERSSON COMPANY

224 GLENWOOD AVE., BLOOMFIELD, NEW JERSEY

OPA Removes Ceilings On Nonconsumer Items

In keeping with the recent Office of Price Administration directives to relieve or remove price ceilings on basic nonconsumer items as a stimulant to production in these lines the following list of materials are of interest to POWER readers. Contained in amendment 13 to Suborder 129, effective Apr 8, they were freed of price control:

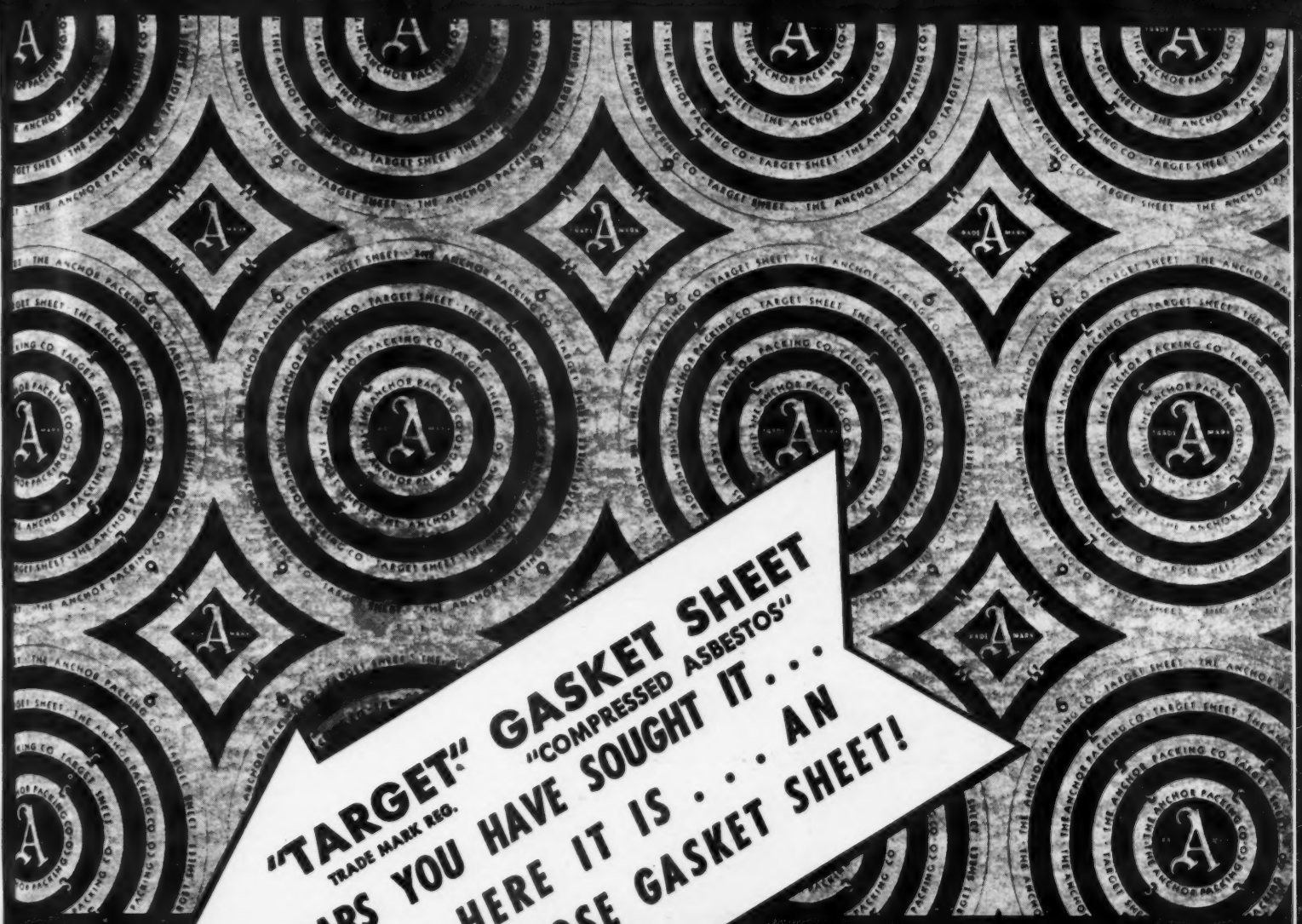
(1) Electric equipment as follows: high-voltage metering equipment, 1000 v and over; current limiting reactors, above 150 kva; diesel or gas, or other internal-combustion generator sets, 150 kw and over—including prime movers, frequency converters, rotary and electronic, all integral capacity units; generators, electric, 150 kw and over; motors, electric ac or dc, 250 hp and over; phase converters of integral capacity; synchronous condensers and synchronous converters, integral capacity; turbine-generator sets, 150 kw and over; waterwheel generator sets, including governors; transformers, 500 kva and over; magnets, lifting, industrial; power mercury arc rectifiers over 5-kw capacity; welding equipment, dc arc-welding models only; welding equipment, ac, including fusion welding, rotating arc-winding, but not transformer welders; welding rods; coated electrodes.

Also, switchgear listed in the National Electric Manufacturers Association Manual, Part IV, dated Jan 31, 1946, in subsection of Section 8 SG as follows—8-SG-3, large air-circuit-breaker group; 8-SG-4, power oil-circuit-breaker group, except outdoor power circuit breakers 15 kv and below; 8-SG-5, power switchboard group; 8-SG-5a′ manual and automatic switchgear assemblies; 8-SG-5b′, metal-inclosed switchgear; 8-SG-5c′, relays, regulators and miscellaneous switchboard devices sold separately; 8-SG-6, power-switching-equipment group, except that for 15,000 v and less.

MISCELLANEOUS EQUIPMENT

(2) Miscellaneous equipment as follows: air preheaters, economizers and superheaters, designed and sold for use with steam-generating equipment as described in Section 12, paragraph (c) or SP 129; alarms, fire, which function entirely by mechanical means; blocks and sheaves, tackle; burners, gas, industrial, designed for use with products covered by Revised Maximum Price Regulation 136; burners, oil, industrial and marine, burning No. 5 oil or heavier, except rotary and gun burners under Maximum Price Regulation 591; chain hoists (manually operated); clamps; clevises covered by RMPR 136; conveyors and conveyor systems, industrial, of stationary fixed design, except those for mining or use with construction plants or attached to construction or mining machinery, portable conveyors and loaders; cranes, bridge, gantry, hammerhead, jib.

Also, engines, diesel, normally operated at 1200 rpm or less, and with piston displacements in excess of 3000 cu in. and having a continuous-duty rating in excess of 400 hp; filters, filter elements and parts, industrial, subject to RMPR 136; grinding balls, ferrous or nonferrous; gaskets, packings and oil seals subject to RMPR 136; hose and tubing, flexible, metallic, except electrical metallic tubing; instruments, me-


"TARGET" GASKET SHEET
TRADE MARK REG.
"COMPRESSED ASBESTOS"
FOR YEARS YOU HAVE SOUGHT IT . . .
NOW HERE IT IS . . . AN
ALL-PURPOSE GASKET SHEET!
THE ANCHOR PACKING CO.

SHEET SIZES
50" x 50"
50" x 150" — 1/32" to 1/4" thick
TEMPERATURE RANGE
0° to 700° F
Stands all reasonable pressures

● "TARGET" Gasket Sheet is an all-purpose gasket material. Adopt it for your gasket requirements and you will not worry whether the apparatus on which it is used is sealing against steam — air — water — oil — gasoline — or other solvents.

We urge you to make "Target" your universal Gasket material and eliminate unnecessary Gasket complications. Write today for full details.

Remember the name — "Target". It's a Bulls-eye for your Gasket troubles.

THE ANCHOR PACKING COMPANY

GENERAL OFFICES: PHILADELPHIA 8, PA.

FACTORIES: MANHEIM, PA., ELKHART, IND., MONTREAL, CAN.

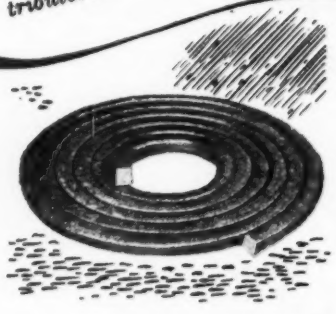
BRANCH OFFICES

Baltimore 2, Maryland	106 Stewart Bldg., Gay and Lombard Streets
Boston 14, Massachusetts	303-04 North Station Building 150 Causeway Street
Buffalo 2, New York	Andrews Building
Cleveland 13, Ohio	523-25-27 Rockefeller Building
Columbus 9, Ohio	172 North Cassingham Road
Chicago 11, Illinois	230 East Ohio Street
Cincinnati 2, Ohio	4 West 7th Street
Detroit 26, Michigan	169 West Jefferson Avenue
Houston 2, Texas	509 Washington Avenue
Kansas City 6, Missouri	1332 Oak Street
Los Angeles 21, California	720 Mateo Street
Montreal 20, Canada	5575 Cote Saint Paul Road
Milwaukee 2, Wisconsin	903 East Kilbourn Avenue
New Orleans 4, Louisiana	418 Common Street
New York 13, New York	100 Sixth Avenue, near Canal
Philadelphia 8, Pennsylvania	401 North Broad Street
Pittsburgh 22, Pennsylvania	405 Penn Avenue
Portland 1, Oregon	1433 S. W. Front Avenue
San Francisco 7, California	156 South Park
Seattle 4, Washington	2207 First Avenue, South
St. Louis 3, Missouri	1407 Pine Street
Tulsa 4, Oklahoma	823 South Gary Place
Wilmington, California	524 North Avalon Boulevard

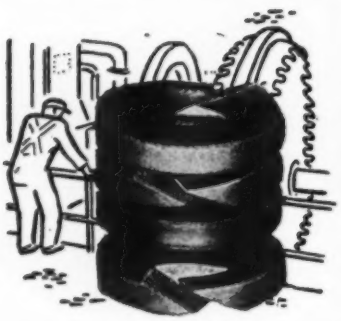
3 Sealing Problems Solved—

These three packings are representative of the extra values built into each product in the complete Belmont line. For every service . . . steam, water, oil, gas, air, acids, alkalis, ammonia . . . your Belmont Distributor has the right packing.

For high pressure steam rods Belmont 30 High Pressure Asbestos Packing has center block pleated on itself, accordion-fashion, at approx. 90° angle with rod. High resiliency and flexibility, extra take-up, extra "edge wear" if packing wears to block.



For "boiling in oil" Belmont 189 Hot Oil Asbestos Packing has extra resistance to penetration. Long-fibre asbestos yarn is firmly braided, each strand treated with a special compound so that saturation and penetration are minimized.



Hollow Center Packing, Belmont 19 provides a point of least resistance for expansion and contraction. Packing "breathes" toward the hole, so friction is kept at minimum point created by the working pressure itself. Light-weight—economical.

THE BELMONT PACKING & RUBBER CO. — BELMONT — PHILADELPHIA, U.S.A.

IN THE BLUE-AND-ORANGE BOX

There is a Belmont Packing for Every Service

Belmont distributors are located in every large industrial center, ready to give you prompt delivery from local stocks.

6 New Folders

Write us for new folders on Belmont Centrifugal and Rotary Pump Packings, Flax Packings, Hollow Center Packings, Oil and Gasoline Packings, Rod Packings, Sheet Packings.

THE BELMONT PACKING AND RUBBER CO.

Butler and Sepviva Streets

Philadelphia 37, Pa.

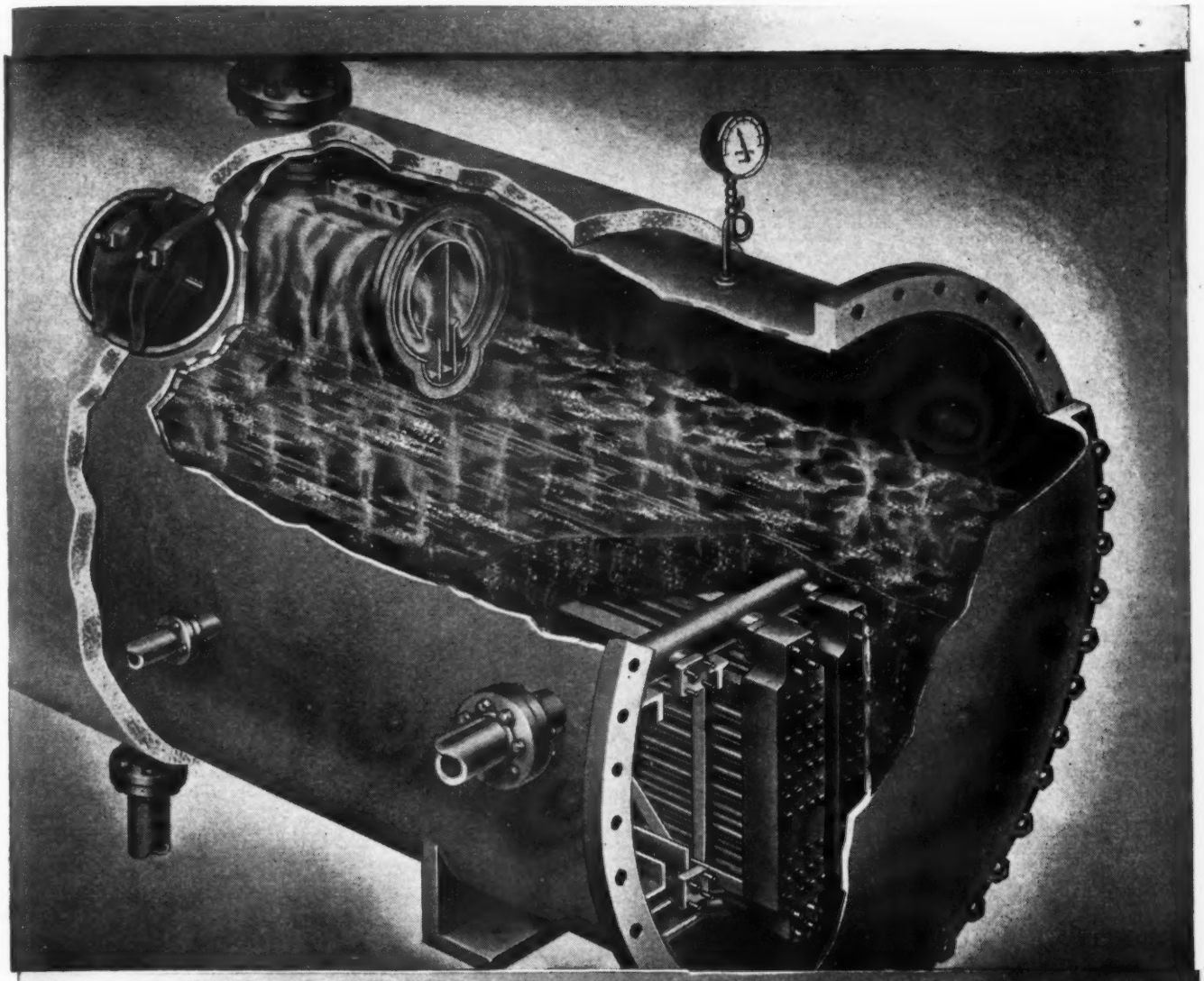
chanical, for indicating, measuring, testing and/or recording (all types covered by RMPR 136); industrial machinery covered by RMPR 136 which is used in the extraction, production or processing of commodities and is not included in categories of products listed in Appendix A of RMPR 136.

Also, liquid controlling and/or regulating devices, manually operated, designed and sold for use with machinery and equipment covered by RMPR 136, but excluding standard general purpose valves and devices; meters, gas, iron and steel cased; meters, water; pulverizers, coal, including burners and auxiliary combustion equipment, installed for primary purpose of pulverizing solid fuel for firing any kind of furnace and these pulverizers are required to be built to the National Bureau of Fire Underwriter Standards; regulators and dampers, power operated; rings, hot-top for ingot molds; rope fittings, Manila and wire; scales, weighing, industrial and laboratory, except coin operated, household, office and store designs; shims, metallic, when fabricated as machine parts; springs, mechanical precision; soot blowers and tube cleaners, power operated, industrial and marine; steam cleaning and degreasing equipment and parts-washing and -cleaning equipment, industrial, except commercial and domestic dish-and-utensil washing and cleaning equipment.

Also, steam-generating equipment, such as industrial power boilers 100 psi and higher, for stationary and marine use, including watertube boilers, horizontal-return tubular boilers, refractory-lined firebox boilers, but not including steel heating boilers as defined in Section IV, ASME *Boiler Construction Code*, such as horizontal firebox boilers, Scotch boilers for stationary use, vertical tube and tubeless boilers, oil country-type boilers and miniature boilers; stokers, industrial and marine, with 1200-lb-per-hr feeding capacity or more; strainers and filters, pipe, industrial and marine; tanks and vessels (used) covered by RMPR 136 and MPR 465; thermostats, bimetallic and bellows types, except those covered by MPR 591 or 188; welding and cutting equipment, gas, limited to torches, tips, regulators and generators; wheels, water.

After touring electrical manufacturers' plants and laboratories, three electrical engineers from India have begun a 3-weeks' study of the Rural Electrification Administration and its program. Their U. S. visit is sponsored by the British government and is aimed at the accumulation of information that might be of assistance in developing Indian electrification. After studying administrative phases of the REA program at Washington, the engineers will visit six cooperatives. Two subsequently will visit power developments in the Northwest.

Power has just learned of the death of Fred Hood who passed away at his home, 1928 Cordova St, Los Angeles, on Dec 7, 1945. He was 78 years old. His remarkable models of marine engines and boilers have been described in POWER at various times. Complying with his final request, Mrs Hood has given his famous triple-expansion engine model to California Institute of Technology at Pasadena for demonstration and study.



Inside Story... ON SK EVAPORATORS

• A look into an SK Evaporator would show the large liberating and tube surface areas which assure maximum heat transfer and high efficiency. The straight, interchangeable tubes mounted in easily removed bundles, facilitate maintenance and cleaning. The use of a centrifugal separator, located inside the shell, prevents carry-over of moisture. Right down the list, each detail is designed to give you superior service.

SK Evaporators, soundly engineered, with good workmanship and sturdy materials, are built to do a job in the best and most efficient manner . . . not to meet a price. Progressive management knows that this overall quality represents real economy of operation and upkeep.

SK Evaporators are manufactured in various designs for stationary steam plants, for marine and for other installations where the use of distilled water is desirable. Investigate all the features of service-proved SK Evaporators, write for Bulletin No. 10-DE.

JET APPARATUS • HEAT TRANSFER EQUIPMENT
STRAINERS • CONDENSERS AND VACUUM PUMPS
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FLOW INDICATORS • RADIAFIN TUBES • VALVES
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8 x 19 Macwhyte Special Traction Steel, PREformed or Non-PREformed

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- Selected steels best for elevator hoisting.
- Wire is drawn in our own mill under strict metallurgical control.
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- PREformed or Non-PREformed.
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Makers of the correct ropes for your equipment

MACWHYTE COMPANY 50th Year 1896 – 1946

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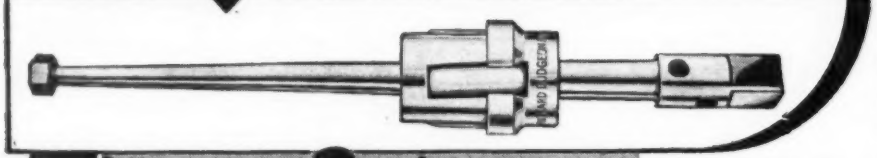
DUDGEON TYPE 16

Built to rigid DUDGEON high standards, design has been simplified to provide a lower cost tool. Expander has only three parts — frame, rolls and mandrel. Frame is one piece heat treated steel; mandrel and rolls hardened tool steel. Rolls are extra long and reversible for double life. Smooth rapid self-feed is featured with a compact design for close work.

..do a better job at less cost!

Knowing how to get the most work out of a good tool takes experience . . . just as it takes even more experience—on and off the job—to make a good tool . . . one that will produce volume work with the least possible effort.

It's this experience—both on the job and in production—that goes into DUDGEON engineering. That's why these tools pace plant improvement . . . providing "tops" in efficiency and durability.



RICHARD *Dudgeon* INC

MFRS. OF TUBE EXPANDERS SINCE 1853

24 COLUMBIA STREET, NEW YORK 2, N. Y.

Complete literature on DUDGEON products — expanders, hydraulic pumps and jacks — available. Write Department G.

APPOINTMENTS

General Electric Co announces appointment of Sydney T Maunder as manager of sales, power-transformer section, succeeding Temple O Eaton. Original transformer div is now two divisions: (1) transformer div has the responsibility for power and distribution transformers, feeder-voltage regulators, lightning arresters, fuse cutouts and capacitors. Harry F McRell is appointed div manager. (2) Specialty-transformer div has responsibility for fluorescent-lamp ballasts, specialty transformers and products, formerly the responsibility of specialty-transformer section. Paul M Staehle is appointed div manager. D F Roloff has been named assistant manager, H K Pritchard manager of sales of general-purpose-components section and C Stonehill manager of sales of lighting-components section of specialty-transformer div. L R Brown will direct both activities as manager of transformer divisions.

H W Pool has been made engineer, steel-mill div, and C M Rhodes Jr, engineer, machinery div, of industrial-engineering divisions of **General Electric Co.**

Tube Turns, Inc, names James H Withers district manager of San Francisco and Los Angeles offices. S M Spears Jr was made asst manager of New York office.

D O Bayless has been elected special factory-service engineer for **Edward Valves, Inc.** He will be stationed in Houston, Tex., servicing Edward users in Southwest and helping sales representatives on specific projects.

Appointment of Edward J Dudley as public relations representative of **American Locomotive Co,** Schenectady, was announced.

Reliance Electric & Engrg Co has made William G Hall manager of a combined renewal parts and service div. He succeeds Arthur W Ray, who retired.

E J vanDyk becomes petroleum-industry field engineer and district manager of sales for Detroit diesel engine div of **General Motors Corp.** The district includes Okla., Kan. and Ill. He will be at Tulsa, Okla.

Crane Co elected John H Collier chairman of board of directors, to fill vacancy left by death of J B Berryman. J L Holloway was made president. Responsibilities of P R Mork, exec vice-president, were expanded.

Charles I Kraus has been appointed sales manager of Alemite distribution div of **Stewart-Warner Corp** and Gustave Treffeisen has been named assistant sales manager.

Appointment of Glenn C Barnaby, with offices in Rialto Bldg, San Francisco, Calif., as district representative of **Terry Steam Turbine Co** in that area was announced.

Eugene P Wigner was elected director of research and development for **Monsanto Chemical Co's** Clinton laboratories at Oak Ridge, Tenn. Robert E Holmes became divisional export manager for company at Everett, Mass. Roy T Cowing handles sales

Equation

FOR BETTER STEEL CASTINGS

It's the *human equation*—the skill and experience of foundrymen that give Sivyer Steel castings their important extra measure of quality.

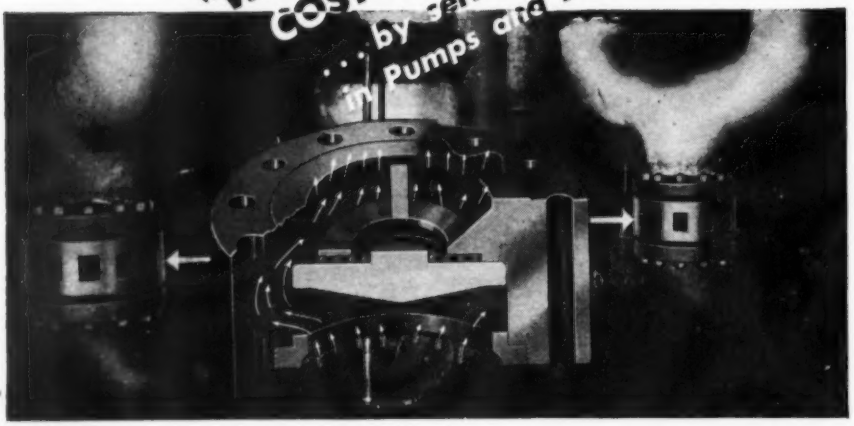
Because all along the line—in every casting step—this skill is at work, putting into Sivyer castings something *more* than what the best of raw materials and equipment alone can do. Something that shows itself in greater integrity of metal . . . in greater dimensional accuracy . . . in better finishing . . . in longer life.

Let Sivyer's nearly 38 years of steel casting experience help you. The next time specify castings bearing the Sivyer diamond ◈ —the mark worth looking for. You'll appreciate their advantages.

SIVYER STEEL CASTINGS

SIVYER STEEL CASTING COMPANY
MILWAUKEE ◈ CHICAGO ◈

"WATER HAMMER" COSTS YOU MONEY!
. . . by serious breakdowns in Pumps and Piping Systems



WILLIAMS-HAGER FLANGED Silent CHECK VALVES

Precision Engineered to Eliminate "HAMMER and BANG" in ANY system with Operating Pressures up to 6,000 lbs.

Heavy duty service records upwards of 17 years without removal from lines . . . Williams-Hager Flanged Silent Check Valves are built to meet the exacting requirements of any end use. No webs to restrict or hamper the flow of liquids . . . the free-floating valve will operate normally and efficiently in *any* position.

Dependably constructed in sizes from 1" to 20" inclusive, from iron, semi-steel, bronze, cast steel, stainless steel or monel . . . pressure resistant to 6,000 pounds.

Do you have the new Williams Catalog for Power Plant Equipment?

specified by Leading Industries for such exacting uses as:

Public Utilities • Water Works • Industrials • Oil Refineries • Paper Mills • Hotels • Hospitals • Chemical Works • Office Buildings • Public Buildings • Breweries • Steamship Lines, etc.

THE WILLIAMS GAUGE COMPANY

Pump Valves . . . Water Gauges . . . Gauge Cocks . . . Pump Governors . . . Steam Traps Feed Water Regulators . . . Water Columns

2055 Pennsylvania Ave. Pittsburgh, 12, Pa.

in Philadelphia area. Ralph E Nelson was made salesman for Chicago. J Kenneth Craver has been appointed coordinator of plasticizers and resins, and Paul G Marsh as assistant production manager of organic chemicals div. A J Pastene has been promoted to manager of company's John F Queeny plant in St. Louis. E T Stehlby has been made assistant plant manager of this plant. At same location, Roy G Hemminghaus, Walter Meyer and J W McCrackin were made manufacturing superintendents.

S P Kinney Engineers, Inc, appointed Watson & Watson, 408 W Clinch St, Knoxville, Tenn., agents for handling Brassert automatic self-cleaning water strainer in the eastern Tenn. district and Fuel Economy Engrg Co, 508 New York Bldg, St. Paul, Minn., as agent in Minn., N. D., S. D. and northern Wis.

Enterprise Engine & Foundry Co appoints W S Everett sales engineer.

Blaw-Knox Co acquires from J O Ross Engrg Corp all engineering, sales, fabricating and installation of Ross Supertherm hot-water heating system in North and South America.

Worthington Pump & Machinery Corp moved their advertising dept from Newark to new quarters in the administration building of the corp at Harrison, N. J.

Richard F Garretson was made Eastern regional manager of **Ransome Machinery Co,** industrial div, a subsidiary of Worthington Pump & Machinery Corp. He is in charge of sales of welding and work-positioning equipment, with offices at Philadelphia.

Homer W Northrup has joined the Chicago technical section of **International Nickel Co.** He will be associated with the foundry activities of INCO in the Chicago territory.

York-Shipley, Inc, elects Ralph Gibbs director of research.

Appointment of seven field representatives to as many district and branch sales offices of **SKF Industries, Inc,** has been announced: New field representatives are J K Redding, Philadelphia office; L E Jacobs, Buffalo; W S Corneille, Milwaukee; F O Hamlet, Chicago; G E Mayhew, Cleveland; B J Fraher, Detroit; and C L Eberlein, Atlanta. In addition, T I Haley and A C Barth, field representatives, respectively, in Portland and Dallas offices, have rejoined SKF after service in the armed forces.

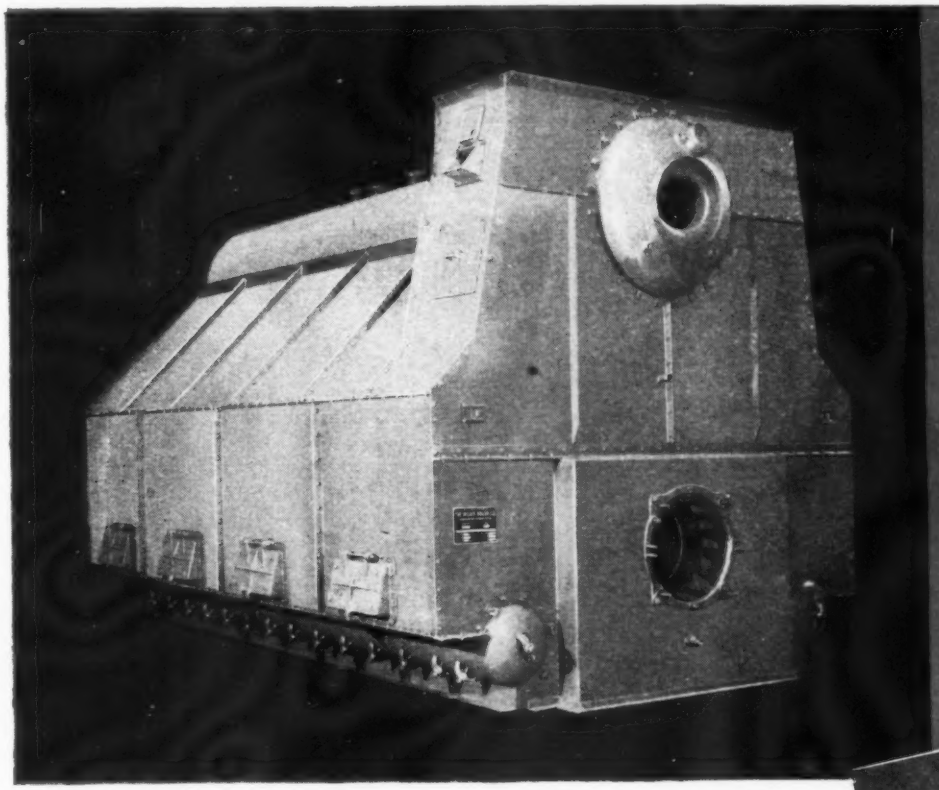
L J Wing Mfg Co names Harang Engrg Co, 840 Lake St, San Francisco 18, as representatives for northern Calif. Edward A. Harang, until recently a U. S. Navy officer, heads the firm and will be joined by his brother, Richard A Harang.

At annual meeting of board of directors and stockholders of **Wheelco Instruments Co,** Claude A Gates, New York City, manager of Zone 1, was appointed vice-president; C H Joy, Cleveland, manager of Zone 2 and at present a director, was appointed vice-president; R A Schoenfeld, Chicago, man-

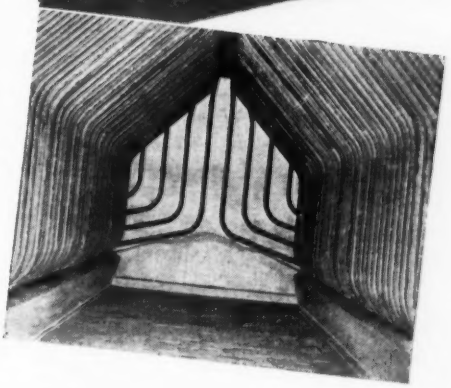
PACKAGE POWER EFFICIENCY FOR YOUR PLANT

WITH WICKES

CROWN TYPE-A BOILERS



- Specially designed so that each furnace wall is a separate steam generator as well as an integral part of boiler unit.
- Drums fully protected against intense furnace heat.
- Front and rear refractory surfaces protected with waterwalls.
- No complicated headers or circulating tubes to require frequent maintenance and repair.
- Conserve head room and floor space.



WICKES PACKAGE CROWN TYPE-A BOILERS typify the combined engineering knowledge and expert workmanship that for nearly a century have distinguished all Wickes products. Patterned after our line of large Crown Type-A Boilers, the Package Unit is engineered for pressures up to 500 p.s.i. and for capacities of 20 to 250 nominal horsepower. Compact, efficient, they are produced as a steel-cased package unit and are shipped ready for operation with a minimum of installation problems. Send us your boiler requirements and our engineers will be glad to determine how Wickes Crown Type-A or other Wickes boilers can increase power efficiency in your plant.

SALES OFFICES • Detroit, Mich.; Chicago, Ill.; New York, N. Y.; Milwaukee, Wisc.; Pittsburgh, Pa.; San Jose, Calif.; Tulsa, Okla.; Fort Worth, Texas; Mexico City, Mexico; Saginaw, Mich.; Portland, Ore.; Boston, Mass.; Indianapolis, Ind.; Baltimore, Md.; San Francisco, California.

THE WICKES BOILER CO.

SAGINAW, MICHIGAN, U.S.A. • RECOGNIZED QUALITY SINCE 1854

Mr. ENGINEER

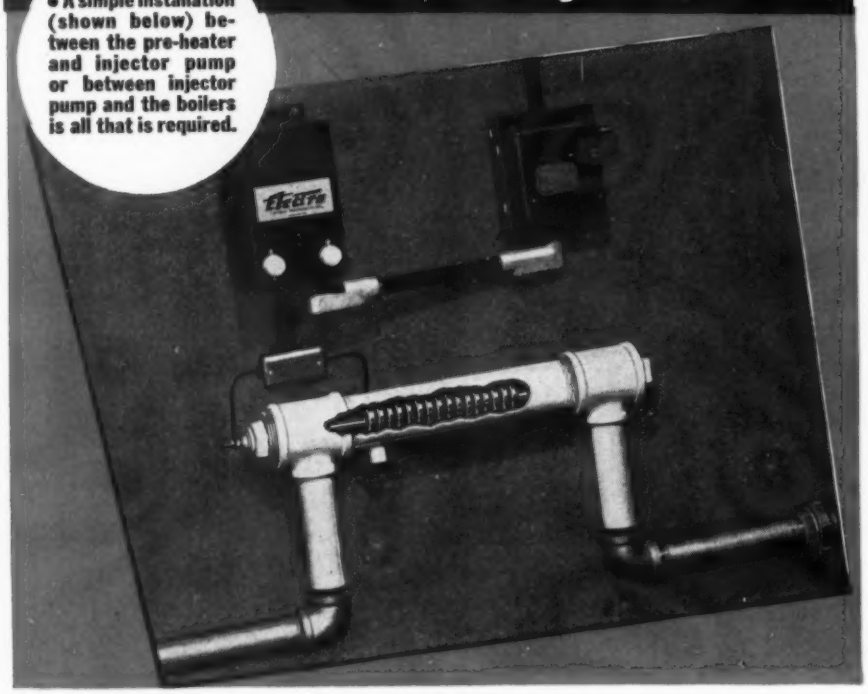
let us prove what

Electro

WATER CONDITIONERS

will do for you

• A simple installation (shown below) between the pre-heater and injector pump or between injector pump and the boilers is all that is required.



Multiple installations and repeated orders from satisfied users, prove that the *Electro* Water Conditioner will help you solve your boiler water problems.

When water is passed through the low wave electrodes, salts and other impurities pick up a charge that makes them repellent to hot boiler tubes and water lines.

ELECTRO prevents lime deposits and scale formation. It also prevents corrosion, foaming, priming and bumping. Embrittlement and cracking are alleviated and pitting is unknown after an Electro installation.

ELECTRO eliminates the use of boiler compounds and catalyzers with their periodic cleaning shut-downs. Algae and foreign growths are stopped immediately.

Send for an Electro Engineer today.

STOMAC ENGINEERING CO. Inc.

2012 W. 25th St. Cleveland 13, Ohio.

Branch Offices: 726 Empire Building Milwaukee 3, Wisconsin — 506 S. Wabash Ave. Chicago, Illinois

ager of Zone 3 and at present a vice-president, was named a director of the company. Charles L Saunders, vice-president, was appointed to the office of executive vice-president. Mr Saunders is in main office and plant at 847 W Harrison St, Chicago.

Norton Co names Fred H Paulson and Curtis H Weissinger sales engineers in refractories div. Both will have their headquarters at Worcester, Mass., office.

Sidney C Palmer has been made manager of marine and transportation divisions, and Frederick S Bacon Jr manager of central station division for New England district of **Westinghouse Electric Corp.** They will be located in Boston.

Sterling Engine Co appoints B Gordon Valetine chief engineer. Company has opened a direct factory branch in San Francisco which will serve the territory west of the Rocky Mountains. Hans Bohuslav, vice-president and director of engineering development and research, will be in direct charge of this new factory branch. He will be assisted by Al Hahn.

Daniel J Killfoile is now on the sales staff of **Alloy Steel Products Co,** Linden, N. J.

John A Roebling's Sons Co appoints Ferdinand W Roebling, third, vice-president in charge of engineering. He succeeds Charles M Jones, who has become vice-president in charge of public and industrial relations. Albert Neroni becomes manager of advertising, succeeding Fred J Maple, who became manager of exhibits.

Formation of a manufacturing development div at **Caterpillar Tractor Co,** under direction of C A Matheny, is announced.

Electric Storage Battery Co, Philadelphia, names John W Weigt as manager of its New York branch at 23 W 43rd St, New York, N. Y., succeeding D P Orcutt, who retires.

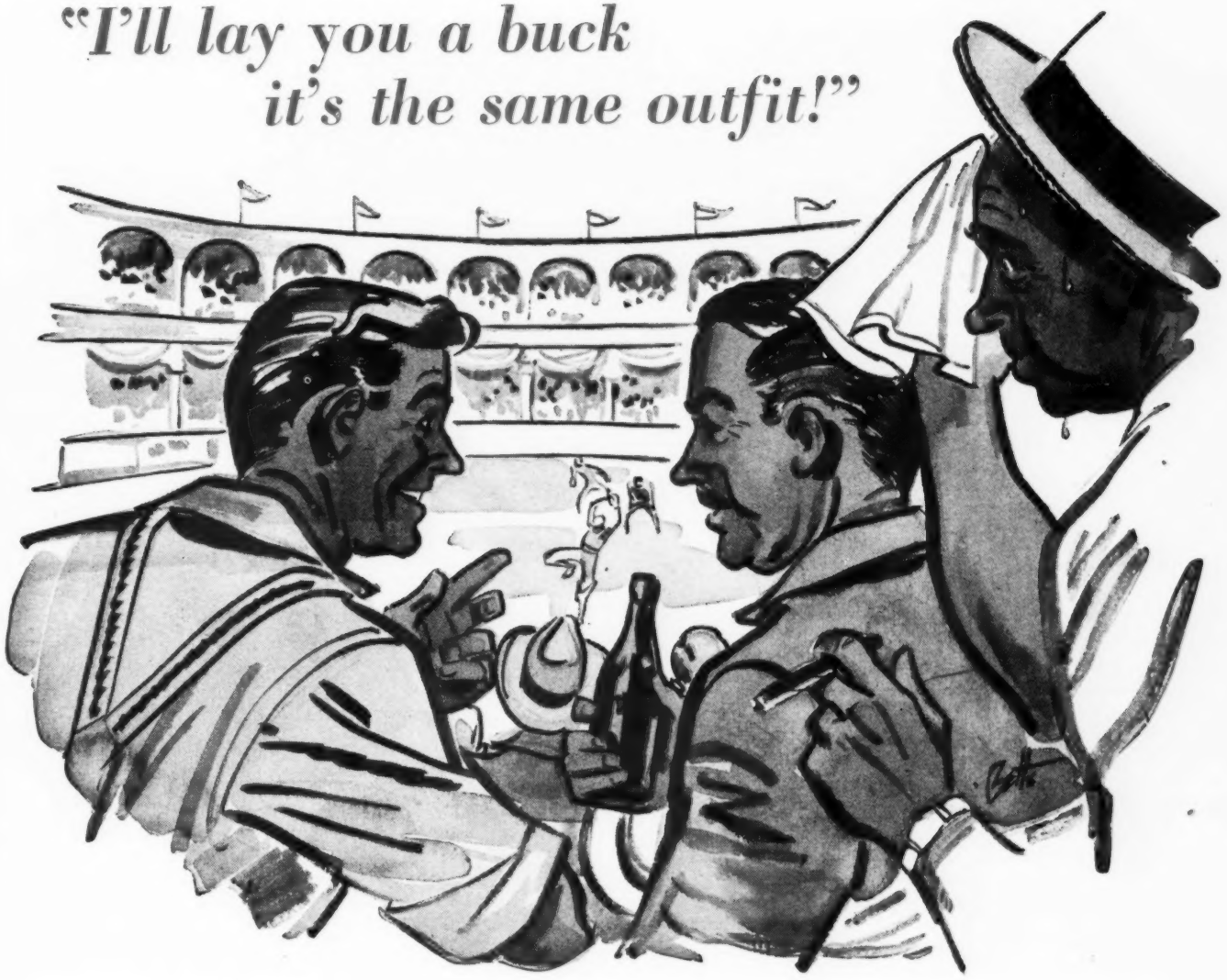
Daniel R Seagrave has been made superintendent of service and erection in Seattle district of **Allis-Chalmers Mfg Co,** succeeding the late R C Norman. Harold P Richmond has joined the New York office as central-station representative specializing in all steam- and gas-turbine matters.

American Chain & Cable Co announces appointment of R H Brown & Co as its Helicoid gage representative in Portland, Ore., and Instruments Supply & Service as Helicoid representative in Tacoma, Wash.

H Cubbie Roane becomes asst district manager of Atlanta office of **Bowser, Inc.**

Board of directors of **Johnson Service Co** re-elected Harry W Ellis, Milwaukee, chairman of board; Joseph A Cutler, Milwaukee, president and general manager; and Oscar G Ward, Chicago, and Maxwell F Rather, New York, vice-president. Richard J Murphy, Milwaukee, formerly secretary and assistant treasurer, was elected secretary and treasurer. New officers named were J R Vernon, Milwaukee, assistant secretary, and Louis V Zachary, Milwaukee, assistant treas-

"I'll lay you a buck it's the same outfit!"



"Go on!" Sam retorted. "The heat's got you, Bill. Maybe you oughta put the insulation on your head."

"My head's all right," Bill declared. "And I guess I know who's installing the magnesia on our own steam lines."

"Maybe you think you know. All I say is, it can't be the same Armstrong. The company I'm talking about makes corkboard, like my nephew used in his new locker plant."

"That's just what I'm saying. Armstrong is an insulation outfit. They handle cold jobs, and heat jobs, too. I've talked to their foremen. Their trucks drive up to our plant. We've got a contract with them. What more do you want?"

"Pipe down, you birds," cut in the man behind them. "Don't you know there's a ball game going on here?"

"Keep your shirt on, fella," Sam shot back. "This is important."

"Look," says Bill. "Let's settle it this way. Monday morning, you phone the Armstrong Cork Company and ask them. If they don't sell heat insulation, I'll buy both of us grandstand seats next Saturday. And if they *do* . . ."

• • •

Sam had to buy the baseball tickets, of course. For Armstrong does furnish heat insulation, as well as low-temperature insulation. Some folks know us best for one, some for the other. Many use our services on both.

In the low-temperature field, Armstrong supplies three kinds of insulation, to hold temperatures all the way down to 300° below zero. For heat applications, we offer a complete line of insulations for steam lines and equipment. And there are five types of Armstrong's Insulating Brick to withstand temperatures all the way from 1600° to 2600°F.

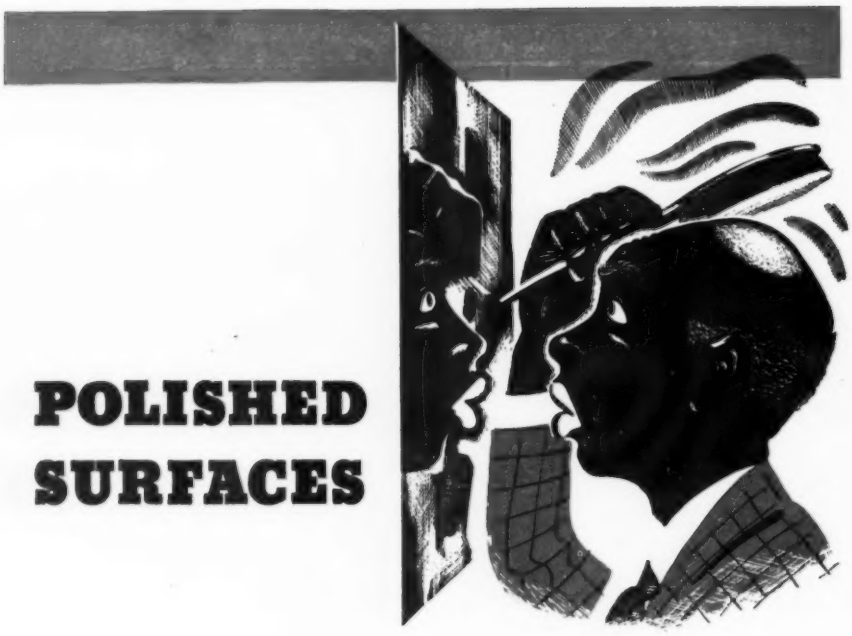
We not only sell the materials, but we'll also be glad to help with your engineering problems. And we can supply skilled workmen to install your complete job. Materials, engineering, and workmanship together make up Armstrong's Contract Service. If you'd like the complete story, send for our new folder: "Armstrong's Insulation Contract Service." We think you'll find it interesting. Just drop a card to Armstrong Cork Co., Building Materials Div., 7006 Concord St., Lancaster, Penna.

ARMSTRONG'S INDUSTRIAL INSULATION

Complete Contract Service For All Temperatures

From 300° Below Zero

To 2600° Fahrenheit



POLISHED SURFACES

One thing about highly polished surfaces — it takes them a long, long time to wear out, even with constant rubbing.

That's one reason why a Helicoid Pressure Gage was still going strong — still accurate to 1/2 of 1% — after 75,000,000 cycles. The movement consists of a polished graphited bakelite cam sliding in a highly polished helical groove. This instead of the conventional spur gears.

There is ample proof that a Helicoid Pressure Gage will remain accurate many times longer than any spur-geared movement gage ever made. This is important if you use pressure gages in any quantity.

SEND FOR THIS CATALOG

See your nearest distributor. Meanwhile send for our catalog— the only technical catalog published on pressure gages.

ACCO

TRADE MARK

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE
Bridgeport 2, Connecticut

urer. Stockholders in an annual meeting elected Seymour F Johnson, Altadena, Calif., to board of directors, succeeding his father, the late Paul F Johnson. J Otto of Milwaukee, Carl F Johnson, Reno, Nev., and Roy M Henry, Evanston, Ill., were appointed directors. Other directors were re-elected.

Foote Bros Gear & Machine Corp announces election of Irving C Maust to their West Coast sales engineering staff. He will be located at the Pasadena office.

Robins Conveyors, Inc, announces that R W Eichenberger, vice-president, has moved to the Chicago office to supervise sales in the Western div. He succeeds J F Meissner, who resigned. Mr. Eichenberger will be assisted by E P Larsen in Chicago office.

B P Spann has returned to **Gardner-Denver Co** as advertising manager.

A J Smith Corp took over ownership of Black, Sivalls & Bryson, Inc. The sale covered both the Kansas City and Oklahoma City manufacturing plants, six wood-tank plants, and a network of branch plants, warehouses, sales offices, and field service offices in U. S. and Canada. Arthur J Smith was elected president and general manager and A H Black chairman of board of directors of Black, Sivalls & Bryson, Inc. Other officers remain in present capacities.

Taylor Instrument Companies announces appointment of N B Nichols as director of its research div. He succeeds H L Mason, who resigned to accept the professorship of mechanical engineering at Iowa State College. Carlton W Miller and William A Mersman, both physicists, joined the research dept. Walter G Countryman returns to research dept after military service.

Malcolm C Durbin has become associated with **Chicago Metal Hose Corp.** He serves as staff project engineer.

Charles E Heintz has been elected vice-president in charge of **Elastic Stop Nut Corp of America** sales.

Appointment of F Dudley Chittenden and George R Vila as assistant development managers of Naugatuck chemical div, **United States Rubber Co,** at Naugatuck, Conn., was announced.

J S Coffin, Jr. Co has made Maleson Co, Philadelphia 6, Pa., P Thompson Tool & Supply Co, New Orleans, La., and John H Marvin Co of Seattle 4, Wash., and Portland, Ore., sales and service representatives.

Benjamin O'Shea has retired as chairman of board of directors of **Union Carbide & Carbon Corp.** He will continue as a director and a member of executive committee. The office of chairman of the board has been abolished.

Appointment of Republic Supply Co of California as distributor of Manhattan industrial rubber products has been announced by **Raybestos-Manhattan, Inc,** Manhattan rubber div, Passaic, N. J. Republic Supply

(*Continued on page* 208)

NEW CATALOGS, BOOKLETS, BULLETINS

Bring Your Equipment Library Up To Date With This Convenient Service

AIR CONDITIONING, HEATING REFRIGERATION AND VENTILATING

1 **PACKAGED WATER HEATING**—O'Brien Steam Specialty Co, 205 Harrison St, Syracuse 2, N. Y. 4-page bulletin No. SM-4 gives features, ratings, specifications, capacities and ranges of O'Brien steam-mixer water heater. This is a package unit, complete with all controls and accessories.

2 **COOLING COILS**—Niagara Blower Co, 6 E 45th St, New York 17, N. Y. Single-sheet bulletin No. 100 describes Niagara liquid cooler for temperature control of chilled water or solutions. Method of operation is explained.

All literature designated with a star (★) may be obtained only by writing direct to the manufacturer on company letterhead, giving writer's name and title.

★ **REFRIGERATION WALL CHARTS**—Henry Valve Co, 3260 W Grand Ave, Chicago 51, Ill. Charts feature large, clear cross-section views of accessories used in cross-refrigeration and air conditioning. The text is factual and informative.

3 **EVAPORATOR SYSTEMS**—Griscom-Russell Co, 285 Madison Ave, New York 17, N. Y. 26-page bulletin No. 364 is profusely illustrated with photographs and diagrams of G-R Bentube evaporators and their details of design, including scale-shedding Bentube heat-transfer elements. Bulletin also includes many heat-flow diagrams of plants equipped with evaporator systems.

BOILERS AND AUXILIARIES

4 **REFRACTORY CONCRETE** — Atlas Lumnite Cement Co, 135 E 42nd St, New York 17, N. Y. 24-page booklet, entitled "Lumnite for Refractory Concrete," contains basic information on materials and methods in making refractory concrete for different temperature and insulating requirements.

5 **STEAM-GENERATING EQUIPMENT**—Industrial Div, York-Shipley, Inc, York, Pa. 12-page booklet No. ID-46-1H, entitled "Facts and Figures," covers case history of a Steam-Pak generator installation in a dairy. Booklet shows cross sections of steam-generating equipment and graphically presents its installation advantages.

6 **SILICON-CARBIDE REFRACTORY**—Refractory Div, Carborundum Co, Perth Amboy, N. J. 36-page bulletin No. 2 outlines general field of Carbofrax application to coal-fired furnaces. Charts, diagrams, tables and installation photographs are included.

7 **COMPACT BOILERS** — John Phillips Badenhausen Inc, 1814 Packard Bldg, Philadelphia, Pa. 4-page bulletin No. 110 describes Badenhausen Perfect-Balance boilers. Sizes and capacities are given.

HOW TO ORDER YOUR BULLETINS

Be sure to fill out, completely, one coupon for each piece of literature you order. (See sample below.) This gives your request authority and helps the manufacturer to address your copy completely.

When you have filled out completely one space for each catalog or bulletin you want, detach along the scored lines and drop the cards in the mail.

Example

Write in circle number of item describing one catalog wanted → (17)
Your Company Name Brown Mfg. Co.
Address 3718 First Avenue
Pottsville, Okla.
Your Name John Smith
Your Title Power Engineer
POWER, 330 West 42nd St., New York

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Your Company Name
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Your Title
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8 REFRACTORIES—Chicago Fire Brick Co, 1467 Elston Ave, Chicago 22, Ill. Chart gives products, sizes and applications of Missouri fire clay. It is a handy desk reference as all the information is tabulated on one sheet.

9 REFRACTORY SPECIALTIES—Ramtite Co, 2549 W 18th St, Chicago 8, Ill. Catalog and data book, entitled "Refractory Specialties," contains numerous cross-sectional drawings, charts, graphs, technical illustrations, definitions of terms, formulae, temperature conversion tables, properties of gases, etc, in field of refractories and their applications.

10 REFRACTORIES—Quigley Co, 527 Fifth Ave, New York 17, N. Y. Set of bulletins describe Q-Chrome, a neutral base refractory cement for furnace construction and maintenance; Quigley Chromix, a chemically neutral, plastic refractory for construction of monolithic furnace hearths; Cast-Refract, a castable refractory for making special shapes, monolithic furnace linings, door linings, door arches and jambs, etc; Fyre-Mortar, a refractory cement for furnace construction and maintenance; Insulag, a refractory insulating lagging.

CONTROLS, MECHANICAL

11 FLOW REGULATOR—Northern Equipment Co, 1051 Grove Dr, Erie, Pa. 4-page bulletin No. 449, entitled "Controlling Feed Flow and Water Level on Chemical Plant's Foster Wheeler Type S-A Steam Generator," discusses the subject thoroughly. Feedwater control is with the two-element Copes Flowmatic regulator. One element responds to changes in steam-flow rate, the other to water-level changes in the boiler drum.

12 AUTOMATIC CONTROLS — Photoswitch Inc, 77 Broadway, Cambridge 42, Mass. 38-page booklet presents photoswitch line of liquid-level controls, photoelectric controls, timers, turbidity controls, pilot relays, etc. Booklet gives construction, operation, capacity, dimensions and price of each control.

13 ROTAMETER PNEUMATIC TRANSMITTER—Dept 6G-3, Fischer & Porter Co, Hatboro, Pa. 8-page No. 55-A describes pneumatic transmitting accessories which may be applied to any Rotameter flow-rate instrument. Transmitter consists of a unique indissoluble magnetic clutch which picks up Rotameter float movement and translates it into external angular motion.

ELECTRICAL EQUIPMENT

14 INSTRUMENT PANELS—Falstrom Co, Falstrom Ct, Passaic, N. J. 8-page bulletin presents Falstrom instrument panels and cubicles. Instructions for ordering standard panels are given. Photographs and diagrams of equipment are included.

15 MOTOR STARTERS—Allis-Chalmers Mfg Co, 645, Milwaukee 1, Wis. Bulletin No. 14B6410 contains informative data on Type H line of motor starters. These starters provide complete motor protection and, in general, can be used with squirrel-cage wound-rotor and synchronous motors ranging in size up to 700 hp at 2300 v and 1250 hp at 4160 or 4600 v.

16 ELECTRICAL INSULATION—Chemical Dept, General Electric Co, Pittsfield, Mass. 24-page booklet describes GE Mycalex, a stone-like product composed of mica and a special glass. Various features of the material, such as dielectric qualities, arc and heat resistance, mechanical strength, water absorption, moldability and machinability are compared with same properties of cold-molded refractory materials, hot-molded phenolics, wet-process porcelain, steatite and fuzed quartz.

17 PANELBOARDS—Falstrom Co, Falstrom Ct, Passaic, N. J. 4-page booklet No. 107-5-144 illustrates pictorially panelboards manufactured by Falstrom. Panelboards are shown for special applications.

18 POWER TRANSFORMERS — Allis-Chalmers Mfg Co, 644, Milwaukee 1, Wis. Divided into three sections, booklet No. B6403 tells of the evolution of the modern power transformer. It portrays photographically how Allis-Chalmers builds shell transformers from winding of circular coils to the time completed unit leaves shops and in other photos presents outstanding installations.

19 ELECTRONICS—Electronic Tube Sales Dept, Lamp Div, Westinghouse Electric Corp, Bloomfield, N. J. 28-page booklet No. A-4726, entitled "The Business Man's Guide to Electronics," explains six fundamental functions of electronic tubes. Among applications described are induction and dielectric heating for tin plating and brazing, molding and curing plywood and heating rayon cord, electronic control for welding electronic regulators, power conversion, safety devices, measuring and inspecting devices.

20 SELENIUM RECTIFIERS—Rectifier Div, Fansteel Metallurgical Corp, North Chicago, Ill. 4-page bulletin No. RDP104 deals with Models DHR-1 and DHR-2 rectifiers for emergency battery charging and general signal shop application. Illustration from photograph, circuit diagrams in engineering drawings, tables and technical description make it particularly valuable.

21 SILICONE RUBBER—Dow Corning Corp, Midland, Mich. 4-page pamphlet, silastic Facts No. 1, presents a general introduction to the new and improved Silastic, the Dow Corning silicone rubber, useful over a temperature range of -70 to 500 F. 4-page pamphlet, Silastic Facts No. 1A, contains information about established applications for Silastic, as well as tables giving physical, electrical and chemical properties of Silastic products.

22 POWER CIRCUIT TRANSFORMERS—Jefferson Electric Co, Bellwood, Ill. 12-page bulletin No. 461PCT includes wiring diagrams and mounting suggestions, along with a detailed table giving dimensions and data on double-wound and single-wound auto transformers, .100 to 10 kva, for reducing from 575- to 460- and 230-v primary to 230 and 115 v. Method for determining transformer capacity requirements is also suggested.

MAINTENANCE AND SAFETY EQUIPMENT

23 WATER-DRIVEN CLEANERS—Lagonda Div, Elliott Co, Springfield, O. 4-page bulletin No. Y-23 points out distinctive and improved features of Lagonda 2000 Series water-driven cleaners for straight and curved tubes. Bulletin also illustrates several sizes of 2000 Series motors and a table lists the many sizes in which the motor is available.

24 SOFT-FACED HAMMER — Greene, Tweed & Co, Bronx Blvd at 238th St, New York 66, N. Y. Bulletin No. BE-13 describes split-jaw construction of the Basa hammer. Information is given on the new replaceable Basa faces. List prices and specifications are included.

25 RUBBER TAPES—B F Goodrich Co, Akron, O. 4-page catalog section No. 9270 on lines of rubber tapes and splicing compounds features a Two-In-One tape which weather-seals wire or cable splices in one operation in less than half the time needed for combined use of friction tape and splicing compound.

(*Continued on page 191*)

FIRST CLASS
PERMIT No. 64
(Sec.510,P.L.&R.)
NEWYORK,N.Y.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

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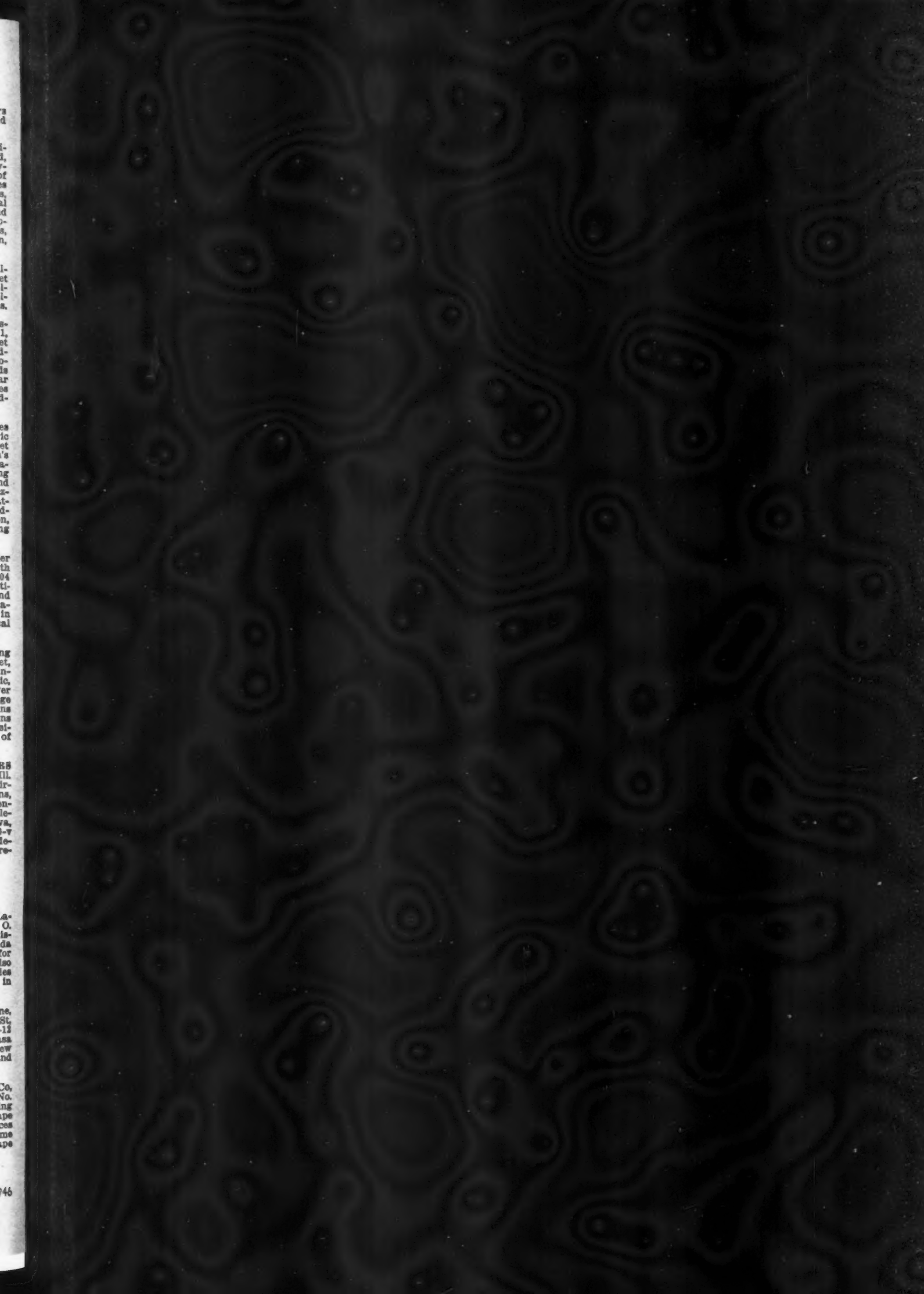
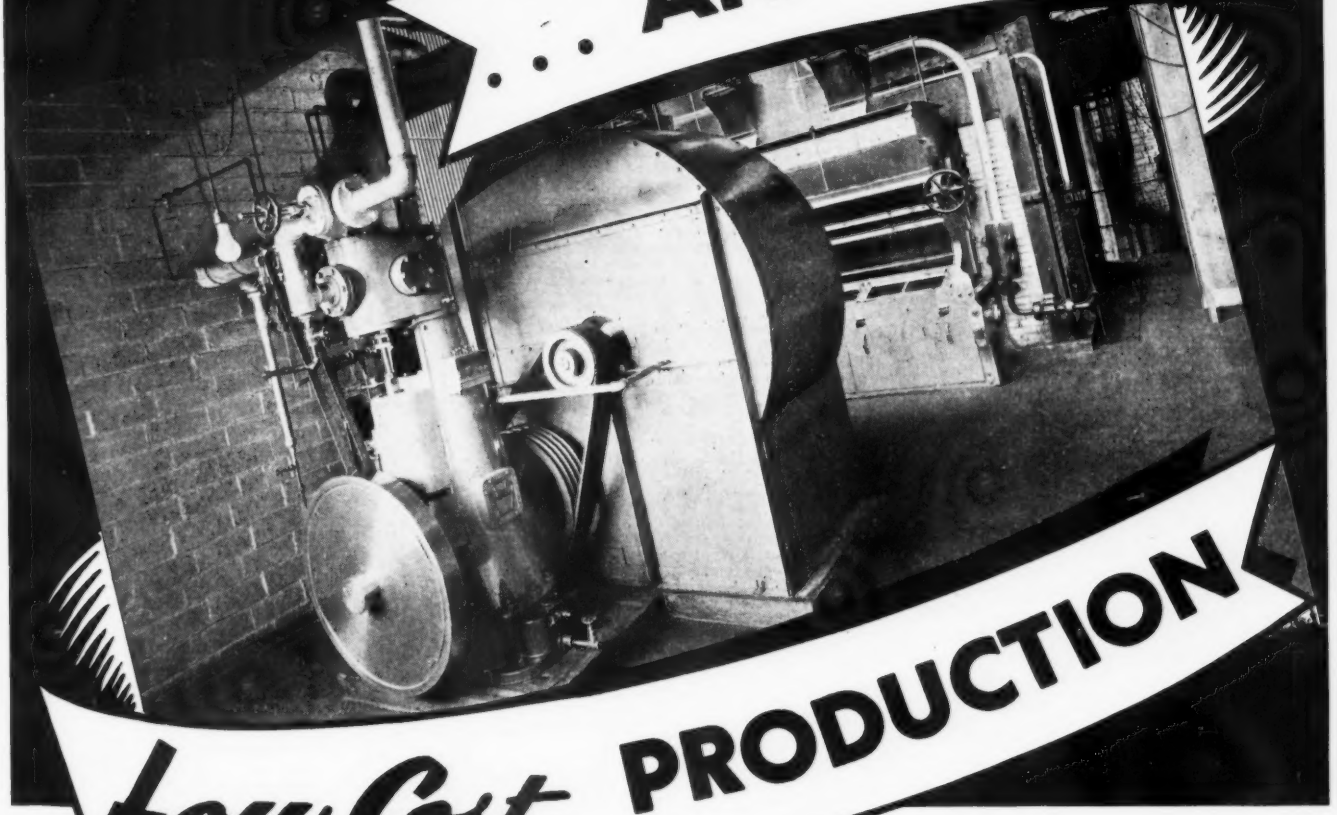


TROY-ENGBERG
STEAM ENGINE

. . . AN AID TO Low Cost PRODUCTION



The fundamental operating objective of all manufacturing enterprises is to make a profit . . . a profit that is possible only if contributing elements in turn operate at lowest possible cost.

Consider drives for compressors, blowers, fans, stokers, generators, pumps, etc. Unless these are powered at the lowest possible cost, they are not contributing their share towards this objective of lowest cost production.

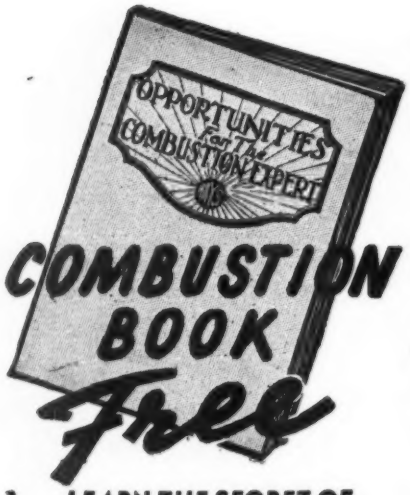
Do you know that the Troy-Engberg Steam Engine has exceptionally low cost probabilities? In many plants, it is driving equipment such as noted above at a cost much lower than would be possible by any other power unit. In fact, costs are so low that the engine has often paid for itself completely in a few months or a year or two.

If you are looking for "aids to low-cost production" . . . check up on the Troy-Engberg Steam Engine. As a starter send for our Bulletin 306.

TROY ENGINE & MACHINE CO.
Established 1870
2516 Railroad Avenue • Troy, Pennsylvania

Interesting information on the Troy-Engberg Steam Engine is given in our Bulletin 306. Send for a copy.

TROY-ENGBERG
STEAM ENGINES • GENERATING SETS • GENERATORS



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COMBUSTION ENGINEERING

There are plenty of big jobs today in Combustion Engineering. Such jobs have always been big pay jobs—and today they are better than ever. High fuel and equipment costs means a greater demand for combustion trained men than ever before.

Do you want such a job? You can have it—if you will train for it. And that is *easy to do.* Just a little of your spare time is required for the simple, easy-reading, practical Hays Home Study Course in Fuel and Combustion engineering.

For 28 years we have specialized exclusively in such training. Today, Hays trained men are more in demand than ever. Now is the time to do what hundreds of others have done who hold substantial positions of responsibility today.

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- International Harvester Co.
- Armour & Co.
- Combustion Engineering Co.
- Riley Stoker Corp.
- Iron Fireman Mfg. Co.
- Commonwealth Edison Co.
- State of Illinois Cities Service (Oil & Power)

and many others.

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You can't lose by getting the facts. We'll send our book, "Opportunities for the Combustion Expert" without obligation or expense to you. Learn how every lesson is administered by trained practical staff men who give the utmost in help and guidance. Get complete outline of course. Learn how to become a key man in Combustion. Send in the coupon now!

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Please send me your Free Book "Opportunities for the Combustion Expert"—No obligation.

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Address.....

City..... State.....

Company Name.....

New Bulletins

(*Continued from page* 190b)

26 TAP EXTRACTORS—Walton Co, 94 Allyn St, Hartford 3, Conn. Folder lists ten tap extractors designed especially for quick and easy removal of broken pipe-threading taps.

27 TUBE CLEANERS—Roto Div, Elliott Co, 145 Sussex Ave, Newark, N. J. 34-page catalog is divided into two parts. Part I assists prospective purchaser in selecting most suitable cleaner for his particular purpose by analyzing various operating conditions and illustrating how these conditions affect the design of cleaner required. In Part 2 representative Roto cleaners and parts that are stocked regularly for immediate shipment are shown.

28 TOOLS—George F Marchant Co, 1420 Rockwell St, Chicago, Ill. Catalog No. 46 describes line of couplings, rivet sets, punches, dies and other tools. Over 200 sketches with full-dimensional details illustrate the various tools.

29 SOFT HAMMERS—Gregory Tool & Mfg Co, 5300 Tireman, Detroit 4, Mich. 6-page catalog includes prices and specifications of Perfect Balance line of soft hammers. There are 14 different models and 56 different numbers shown, ranging in size (dia of head) from ⅝ to 2½ in. and in weight from 3 oz to 10½ lb.

30 FIRE-FIGHTING EQUIPMENT—Pyrene Mfg Co, 560 Belmont Ave, Newark 8, N. J. 20-page booklet, entitled "Air Foam," tells how air foam is produced either by portable playpipes or stationary foam makers. This new air foam is formed without chemical reaction.

31 SAFETY TOOLS—Ampco Metal, Inc, 1745 S 38th St, Milwaukee 4, Wis. 28-page catalog No. 117 covers Ampco safety tools made of Ampco metal and Ampco beryllium copper. Over 500 items are listed. Folder with catalog gives current prices.

MAINTENANCE MATERIALS

32 CLEANING MATERIALS — Oakite Products, Inc, 22 Thames St, New York 6, N. Y. 20-page manual gives specific method and material recommendations for handling cleaning, degreasing, descaling, derusting, paint stripping and related operations encountered in power plants. It includes concise data on 71 different maintenance cleaning and related jobs.

33 REPAIR CEMENT—Smooth-On Mfg Co, 570 Communipaw Ave, Jersey City 4, N. J. 40-page pocket-sized handbook presents many short-cut, practical, tested repairs to plant equipment. Instructions for repair of equipment are given.

34 METALLIC PACKINGS—C Lee Cook Mfg Co, Louisville, Ky. 36-page catalog No. 440 describes comprehensive line of Cook's packings for piston rods of all engines and compressors. Photographs, cross-section views, diagrams and tables are included.

35 FLOORING MATERIAL—Walter Maguire Co, 330 W 42nd St, New York 18, N. Y. Bulletin No. 601 presents Emeri-Crete, a heavy-duty non-skid non-absorbent and acid-resistant industrial flooring material. Emeri-Crete is made with Cortland emery aggregate, a scientifically blended aggregate of 100% selected emery, to which only cement and water are added.

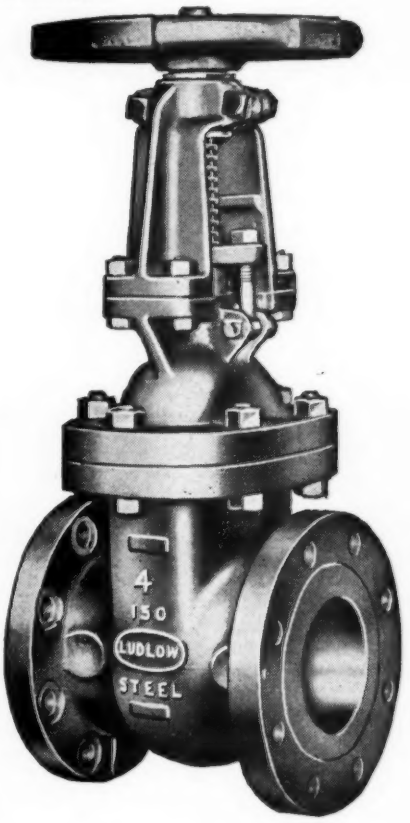
36 PROTECTIVE COATING—Geo R Mowat Co, 24 W 40th St, New York 18, N. Y. 4-page pamphlet discusses Hytemp Klearlak, a protective coating that bonds firmly to metal, wood or cementitious surfaces.

37 REPAIR MATERIALS—Stonhard Co, 403 N Broad St, Philadelphia 8, Pa. 8-page pamphlet serves as a handy reference for guidance in solving maintenance problems arising in operation of power plants, water works, sewage disposal plants, etc. Typical of the many problems for which a solution has been outlined are hydroelectric dam and building maintenance, prevention of water loss from reservoirs, repair of receiving bin and charging room floors, etc.

MODERN
FROM HANDWHEEL TO FLANGE

No point of good engineering practice was overlooked in designing the Ludlow Cast Steel Wedge Gate Valve line. The sturdy lugged-rim handwheel which provides a slip-proof grip on the cool rim and the heavy split yoke to take the thrust, with the handy cast lugs for use as a follower shelf during repacking, are but two exterior examples of the superiority of this Ludlow design.

Write for complete Ludlow Valve Catalogs.



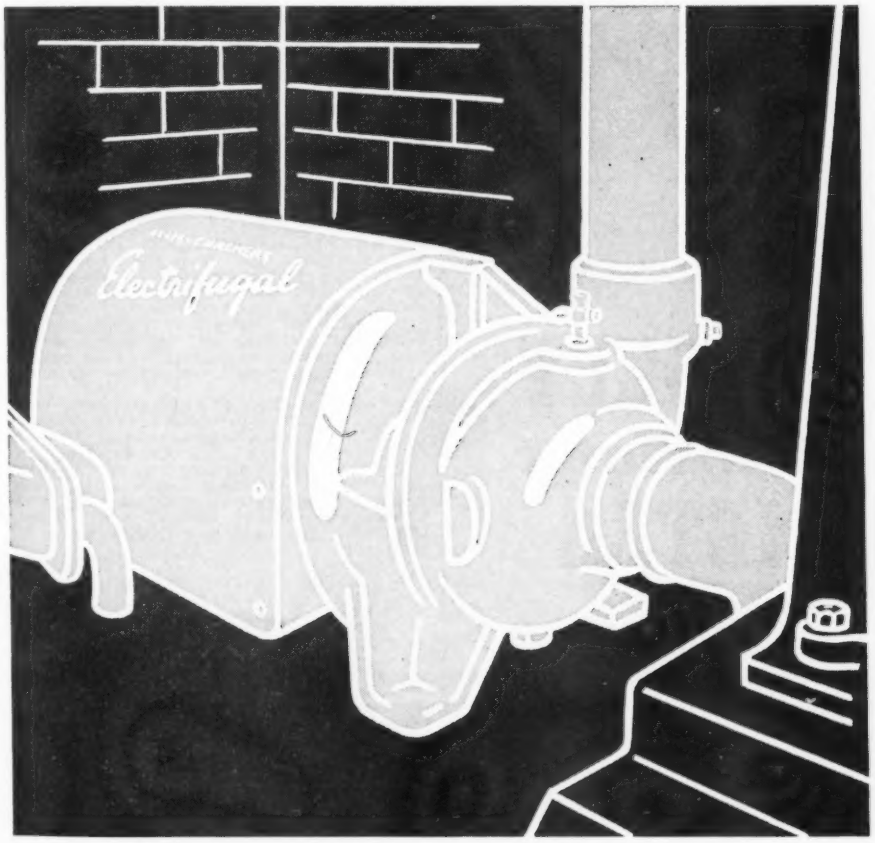
Ludlow Cast Steel Wedge Gate Valve. Now made in sizes 4" to 12", 150 lb. series only.

The LUDLOW VALVE MFG·CO·INC· SINCE 1866 TROY·N·Y·

Economical "Package" Pump Saves SPACE and MONEY

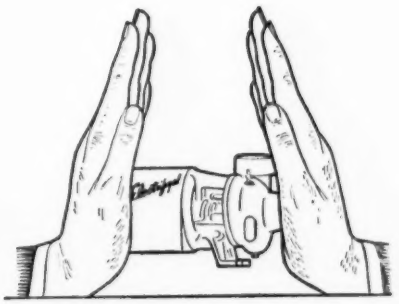
By combining pump and motor into one compact unit, Allis-Chalmers engineers created the "Electrifugal" pump — that requires *one-third less space.* But . . . more than that . . . it costs you *less to buy — less to install — less to operate* — and has a wide range of applications.

The "Electrifugal" pump is a popular member of the complete Allis-Chalmers line of centrifugal pumps and motors: single or double suction — multi-stage — capacities to 170,000 gpm.



TIGHT SQUEEZE! — But this "Electrifugal" pump was built for close quarters. Allis-Chalmers engineers have developed and perfected the close-coupled pump through 20 years of experience. Built in stock sizes from ¾ to 25 h.p.

A 2037



MORE QUICKLY INSTALLED

Comes completely assembled. Just bolt down four supports, make pipe and power connections — and start pumping! Operates in any position.

MORE QUICKLY SERVICED

Easy to get at rotor, impeller, packing and all moving parts. Take it apart and put it together fast. Down time reduced to a minimum.

YOU SAVE ON MAINTENANCE

Ample bronze wearing rings — seal cage and valve—shaft sleeve and deflector — five packing rings — precision workmanship and other quality features add up to longer life, less maintenance cost.

UNDIVIDED RESPONSIBILITY

Allis-Chalmers builds both pumps and motors — backs them up with unsurpassed experience and reputation in both fields. Call your A-C office or dealer for help on any pumping problem . . . or write for bulletin No. B6018. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

ALLIS-CHALMERS

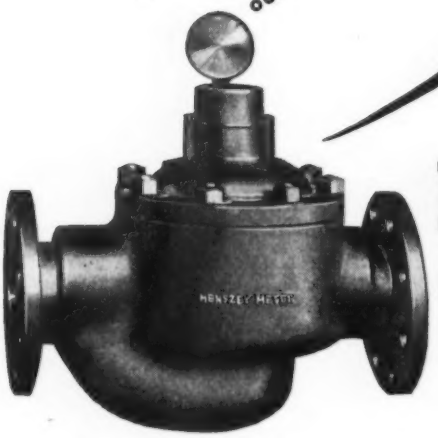
One of the Big 3 in Electric Power Equipment-Biggest of All in Range of Industrial Products

Electrifugal **PUMPS**

ACCURACY ASSURED!

✓ Built-in Accuracy
Rugged construction without close clearances.

✓ Easy to Check
Easily tested right on the job without costly apparatus.



HENSZEY Feed Water METER

"Double Check" accuracy is why Henszey Meters are used for dependable measurement of boiler feed water, boiler blowdown, condensate, chemicals and other similar liquids. If you have a hard-to-measure problem that requires unfailing accuracy — write today for a practical answer from Henszey . . . representatives in leading cities.

HENSZEY COMPANY · Dept. D6, Watertown, Wis.

HENSZEY

FEED WATER METERS

Continuous Blowdown • Distillation Systems • Heat Exchangers
Boiler Feed Regulators • Flow Indicators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

38 **DIESEL-ENGINE CLEANING**—Oakite Products, Inc, 22 Thames St, New York 6, N. Y. 4-page folder No. 6422 describes three maintenance procedures for keeping diesels clean.

39 **INDUSTRIAL LUBRICANTS**—Brooks Oil Co, 315 E Carson St, Pittsburgh 19, Pa. 12-page bulletin covers in detail unusual properties of IP Leadolene and features ten outstanding examples of the new IP lubricant's success in actual application.

MECHANICAL TRANSMISSION

40 **UNIVERSAL JOINTS**—American Gear & Mfg Co, 6633 W 65th St, Chicago 38, Ill. 4-page bulletin No. 320 gives outstanding features of White-Line universal joints. Standard catalog numbers, specifications and prices are included.

41 **FLEXIBLE COUPLING** — Coupling Div, John Waldron Corp, New Brunswick, N. J. 20-page catalog No. 57 describes the new Waldron Series A flexible coupling. Types, sizes and ratings are given.

42 **COUPLINGS** — Thornhill-Craver Co, 1701 Lockwood Dr, Houston, Tex. 24-page catalog No. D-46 covers Unibolt line. Included are steel couplings, adjustable wing valves, etc. Catalog includes photographs, tables and charts relating to the equipment.

METERS AND INSTRUMENTS, ELECTRIC

43 **ELECTRICAL INSTRUMENTS**—Norton Electrical Instrument Co, Manchester, Conn. 18-page catalog No. 17 lists Norton ammeters, voltmeters and wattmeters, comprising three different systems: (1) moving coil (2) electro-magnetic (3) electro-dynamometer. Each has a movement of light, rigid construction, balanced in selected sapphire jewel bearings.

44 **PANEL INSTRUMENTS** — Burlington Instrument Co, Box 589, Burlington, Iowa. 20-page catalog No. 46 features a detailed illustration of the Burlington precision movement together with a complete explanation of operating advantages, dimensional drawings and panel layouts for each Burlington model, as well as ranges, scale division, resistance and list prices.

45 **INDICATING INSTRUMENTS**—Weston Electrical Instrument Corp, Newark 5, N. J. New publication, entitled "Weston Engineering Notes," provides pertinent application engineering information for users of electrical indicating instruments. First issue features articles entitled "The Galvanometer and the Bridge" and "Copper Oxide Rectifiers as Used in Measuring Instruments."

METERS AND INSTRUMENTS, MECHANICAL

46 **FLOW INDICATOR**—Builders-Providence, Inc, Providence 1, R. I. Single sheet bulletin No. 360 gives features of Flo-Gage, a midget differential meter for indicating flow rate of liquids and gases through lines containing orifices, venturi tubes and insert nozzles as differential producers.

47 **SWITCHBOARD TACHOMETERS** — Metron Instrument Co, 430 Lincoln St, Denver 9, Colo. Single sheet covers switchboard tachometers working on a new principle. These tachometers are not of the generator type. The head consists merely of a simple contact-making mechanism which is connected to indicating unit by an electric cable.

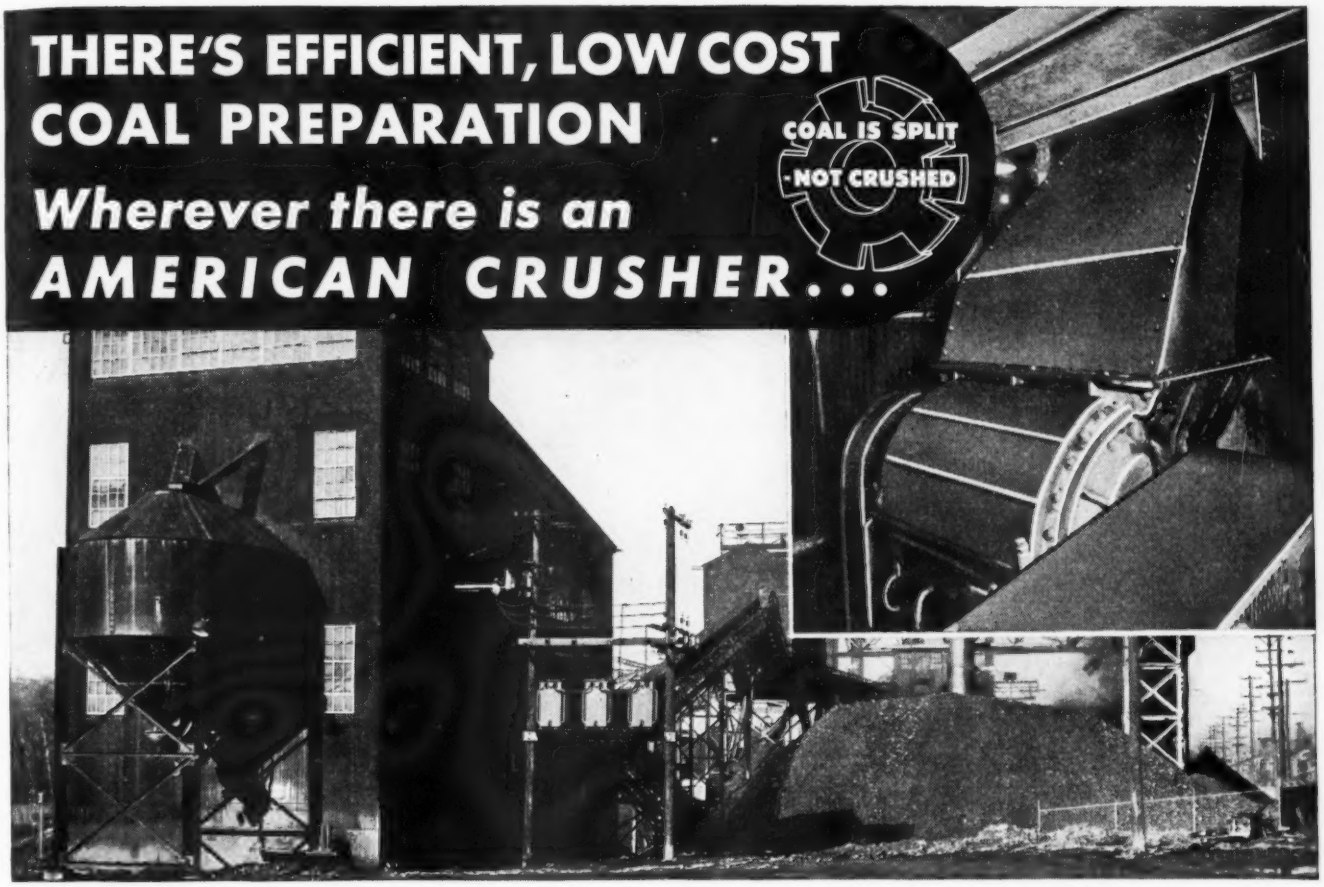
48 **BELLOWS-DIFFERENTIAL FLOWMETERS**—Bristol Co, Waterbury 91, Conn. Bulletin No. F1603 describes features of Bristol bellows-differential flowmeter body, which requires no mercury. Cross-section drawing of meter body illustrates unique method used to transit bellows motion to pen arm.

49 **TACHOMETERS** — Herman H Sticht Co, 27 Park Pl, New York 7, N. Y. 4-page bulletin No. 1045 shows nine different tachometers which can be supplied by the Sticht firm. Portable and stationary designs, single and multiple ranges, domestic and imported Swiss tachometers are included.

(*Continued on page* 198)

THERE'S EFFICIENT, LOW COST COAL PREPARATION

Wherever there is an AMERICAN CRUSHER...

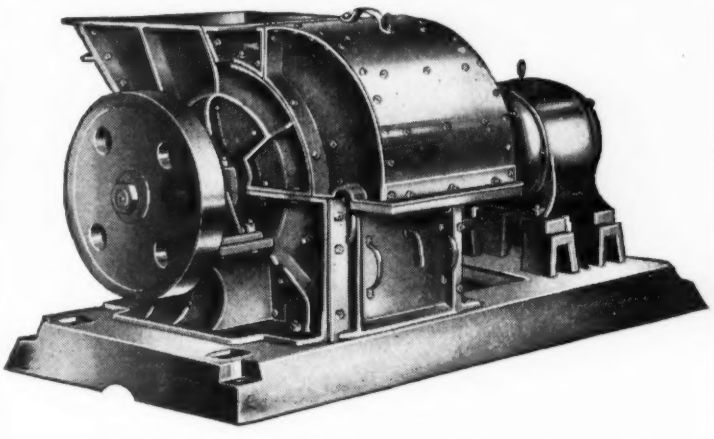


At the Windsor Power House Coal Co., Power, W. Va. preparation plant shown above, the American Rolling Ring Crusher Model 405 (in insert) is in daily operation reducing 5 x ¾" coal to—¾" at the rate of 230 TPH.

Throughout the country, in the many plants with American Crusher installations, you'll find efficient coal crushing resulting in efficient firing.

American Rolling Ring Crushers, with their patented shredder ring action which *splits coal instead of crushing it,* assures uniform sizing. Fines are controlled to a minimum or maximum and no oversize is passed. The crushed product is a constant yield of stoker or pulverizer size.

The *total operating cost* of Americans is *less than 1¢ per ton.*



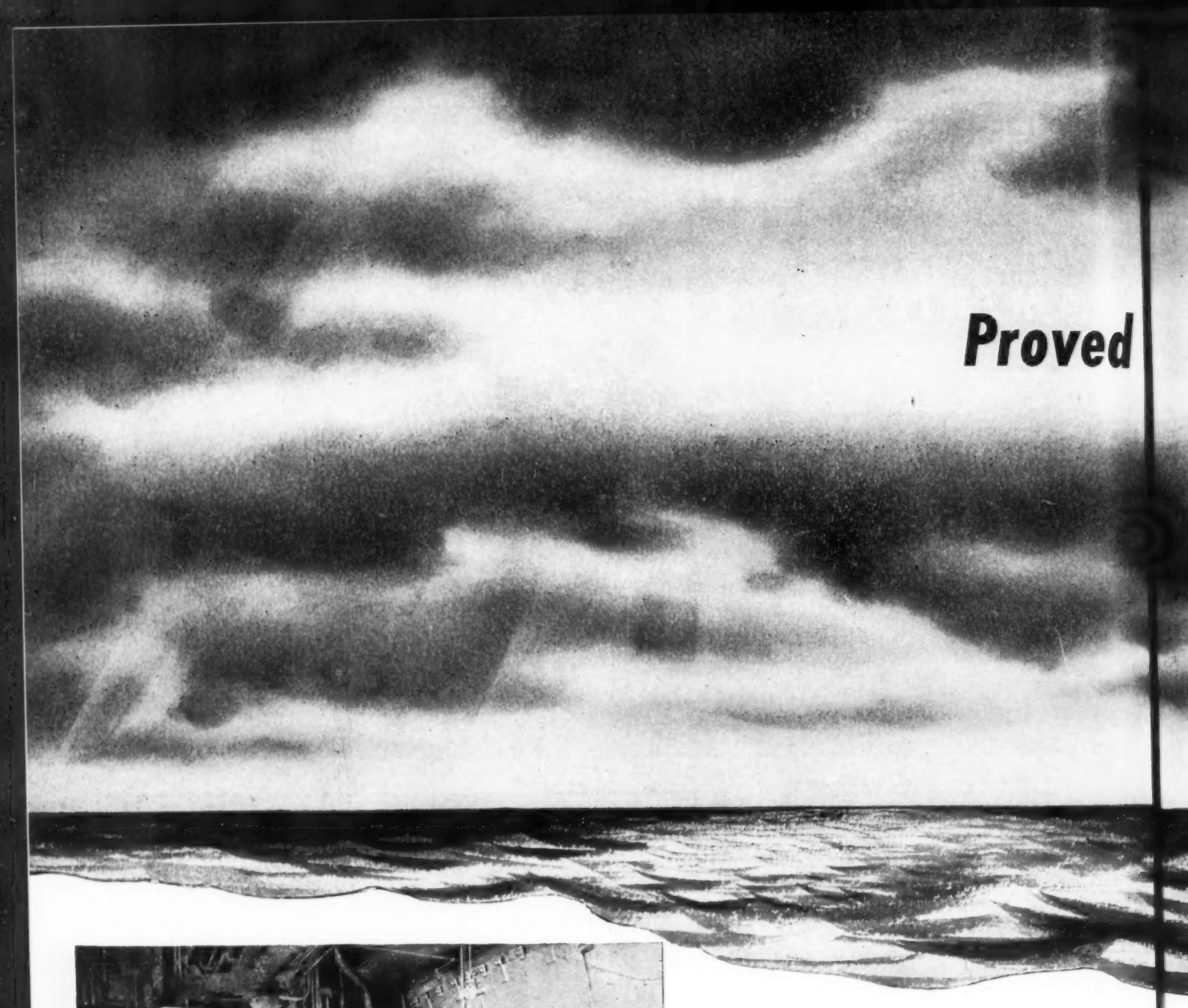
The American "S" Crusher for power plants is a compact, complete crushing operation which is installed in minimum head room without extensive conversion and with no auxiliary crushing facilities.
There is an American Rolling Ring Crusher to fit your needs. Capacities up to 500 TPH.

Send for bulletin "Crushing Coal At Less Than 1c Per Ton"

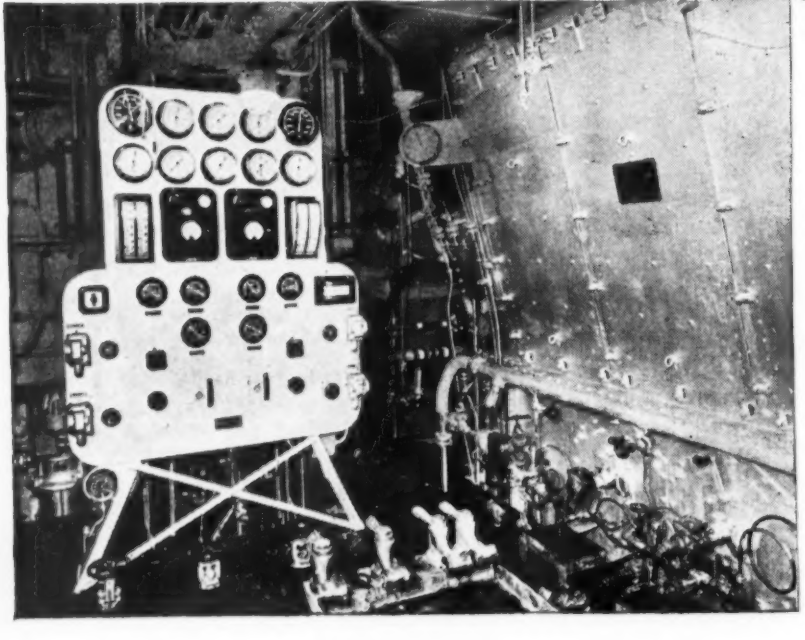
American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1349 Macklind Avenue
St. Louis 10, Mo.



Proved



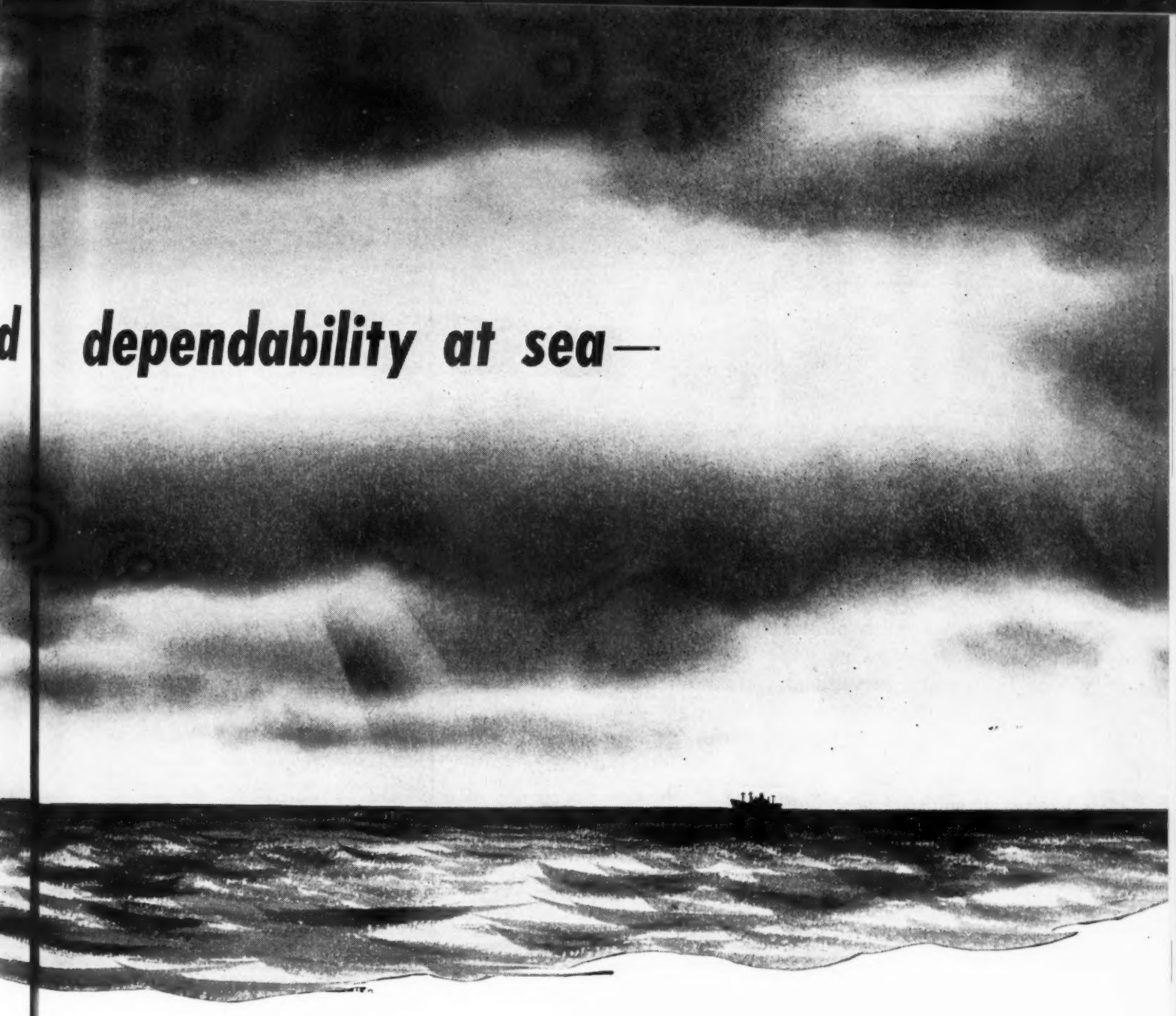
proves

Hagan Automatic Combustion Control "went to sea" ten years ago—the same control, in all essentials, as the control developed by Hagan for power plants on shore.

During the war, Hagan Control was installed on hundreds of ships, carrying war cargoes through sub-infested waters to the fighting fronts all over the world. In those ships Hagan Control saved manpower, cut down fuel consumption, eliminated tell-tale smoke—and did this day after day, in all kinds of weather, often under enemy fire. One ship, for example, was torpedoed and abandoned—

HAGAN CORPORATION, HAGAN BUILDING, PITTSBURGH 30, PA.

HAGAN
HALL
BUROMIN
CALGON



dependability on shore

but stayed afloat. When the crew returned to it twelve hours later, steam was up, and the engines were ready for an instant start.

The simplicity of design and ruggedness of construction, which keeps sea-going Hagan Control operating, with no more maintenance than any ordinary mechanic can provide, is important to every power plant operator.

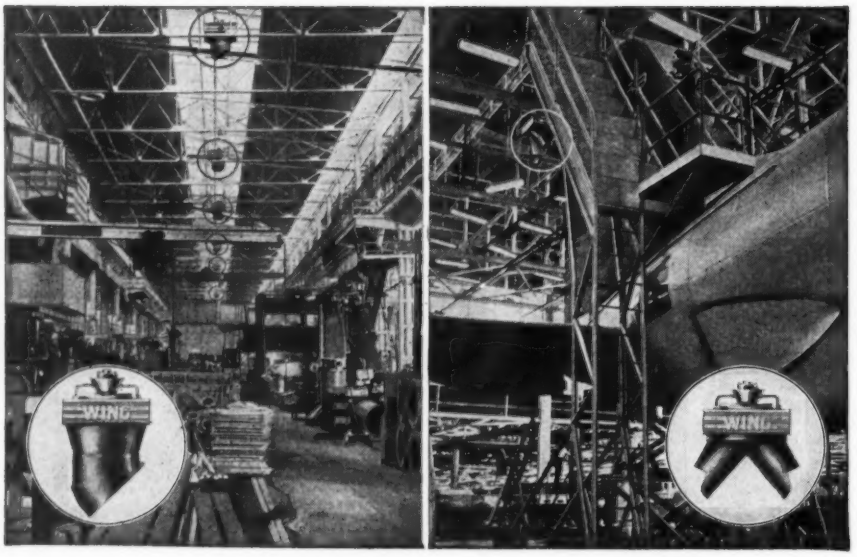
It isn't a matter of life and death on shore, where a telephone call will bring a service man in a hurry. It is, however, a matter of economics. Boilers "off the line," even for a few hours, may seriously interfere with plant operation, and cause considerable loss.

Hagan Controls have set phenomenal records for continuous service because they are built on the Hagan principle that *control* and *metering* are separate functions. With Hagan Control, every instrument on the panel may be inaccurate or out of service, without disturbing the function of control to the slightest degree.

For Combustion Control that won't "let you down," specify Hagan. Our engineers are at your service.

HAGAN *Automatic* COMBUSTION CONTROL

The pioneer . . . and still the leader



Two Problems in Plant Heating Solved by WING Revolving HEATERS

TWO striking instances of the unique advantages of Wing Revolving Heaters are presented in the photographs above.

At the left is one of the shops of a large shipbuilding concern, where a high ceiling and a crowded shop area of 802 ft. x 156 ft. presented a heating problem that could not be overcome by ordinary heating systems. The solution was Wing Revolving Heaters, located 61 feet above the shop floor, projecting heated air down to the working level through slowly revolving outlets, circulating the heat thoroughly to every part of this huge shop in a constant, even temperature.

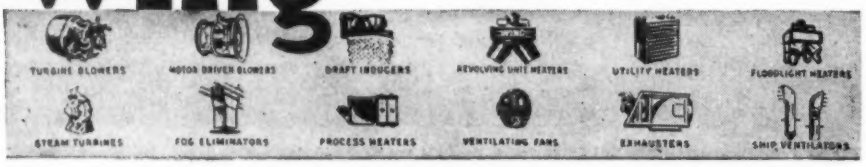
At the upper right is part of the assembly shop of one of the world's largest builders of cargo planes. This modern plant is heated by Wing Revolving Heaters. No other type of heater could so thoroughly and evenly heat a plant of this kind, where the massive planes form imposing obstacles to the projection of heated air from fixed discharge outlets. But with the slowly moving streams of warm air from the revolving discharge outlets of the Wing Heaters, circulating around and under the huge plane bodies, wings, rudders, stabilizers, etc., the plant is kept at a uniform, comfortable temperature.

Operating officials in both plants find that the sensation of warm, live, invigorating comfort enjoyed by the workers is stimulating to production. And in summer, with the steam turned off and the fans on, a cooling effect is obtained that is likewise conducive to production.

Write for a copy of Bulletin HR-4.

Wing **L. J. Wing Mfg. Co.** 50 SEVENTH AVE. NEW YORK 11, N. Y.

Factories: Newark, N. J. and Montreal, Canada



50 PRESSURE GAGE — Helicoid Gage Div, American Chain & Cable Co, Bridgeport 2, Conn. 16-page catalog No. 400 consists of cutaway photographs and line drawings on line of Helicoid gages, how they work, what goes into them, how they're put together and reason for their accuracy.

51 FLOW INDICATORS — Schutte & Koerting Co, 12th & Thompson St, Philadelphia 22, Pa. 4-page bulletin No. 18-W discusses Schutte & Koerting flow indicators, including sectional drawings of construction features, operating principles, applications and characteristics of different models.

52 POTENTIOMETER-PYROMETER — Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, O. 16-page bulletin No. 232, entitled "Bailey Pyrotron Electronic Potentiometer Pyrometer," describes and illustrates various indicating, recording and controlling combinations. Bulletin gives performance data and outlines principle of operation.

53 MANOMETERS — Simplex Valve & Meter Co, 6780 Upland St, Philadelphia 42, Pa. 8-page bulletin No. 200 describes line of Simplex fixed and portable manometers for water surveys and similar flow-rate measurement. Also included is valuable engineering data on manometers.

54 HAND TACHOMETERS—O Zernickow Co, 15 Park Row, New York 7, N. Y. Single sheet gives advantages and specifications of O-Z improved hand tachometers. Photographs of equipment are shown.

PIPING, FITTINGS, VALVES AND SPECIALTIES

55 SOLENOID VALVE—Allied Control Valve Co, South Norwalk, Conn. 4-page bulletin No. 462 contains pertinent information on the new V5-100 solenoid valve which, despite its small size, operates at pressures up to 150 psi.

56 SWAY BRACE—Grinnell Co, 260 W Exchange St., Providence 1, R. I. 8-page booklet presents the Grinnell pre-engineered sway brace. This sway brace supplies a 2-way force which opposes movement or vibration of piping with an instant-acting counterforce to bring pipe back to normal position in plane of control, yet no forces are exerted on piping system.

57 STAINLESS-STEEL BELLOWS—Chicago Metal Hose Corp, Maywood, Ill. 12-page booklet No. SSB-46, entitled "CMH Stainless Steel Bellows," contains diagrammatical cross-section views and up-to-date information on these bellows as equalizers, compensators, expansion joints, flexible connectors, for flow control, vapor and steam traps, thermostatic instruments, electrical controls and many other industrial applications.

58 STEAM TRAPS—Yarnall-Waring Co, Chestnut Hill, Philadelphia 18, Pa. 6-page folder No. T-1720 gives construction, operation and advantages of Yarway impulse steam traps. Folder announces traps now available for quick shipment.

All literature designated with a star (★) may be obtained only by writing direct to the manufacturer on company letterhead, giving writer's name and title.

★ **STEEL VALVES**—Edward Valves, Inc, East Chicago, Ind. Booklet, entitled "Edward Comes to Call," makes it possible for steel valve specification engineers and buyers to make a trip to the Edward plant without leaving their desks.

59 PIPE LOCATOR—Nilsson Electrical Laboratory, 103 Lafayette St, New York 13, N. Y. 6-page folder contains a brief description of new Model 112 pipe locator, how to operate it and notes on available accessories.

60 BOILER BLOWDOWN VALVES — Strong, Carlisle & Hammond Co, 1392 W 3rd St, Cleveland 13, O. 4-page catalog No. 102 discusses construction and operation of Strong Evrtyte valves. 4-page folder with catalog explains reason for boiler blowdown and the application of a control valve.

(*Continued on page 202*)

Check list
for Peacetime Operation

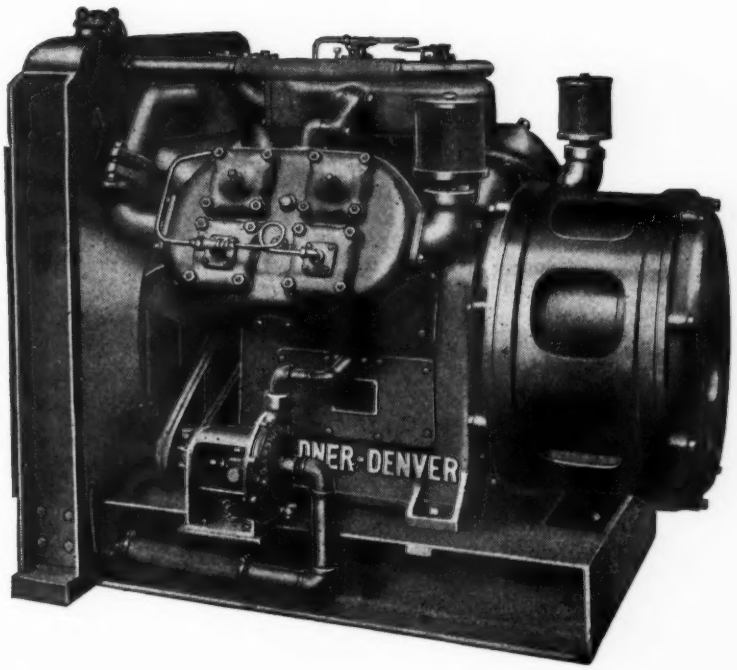
Equipment has suffered during the war. Your compressor, for example, may have had to run extra long hours without adequate attention and may need to be replaced to assure dependability and low operating costs.

The Gardner-Denver "WB" Vertical Water-cooled Compressor provides a dependable, low-cost source of air power. Its rugged construction and advanced design have established long records of economical service. Cylinders and compression heads are completely water-jacketed to assure continuous operation. Compact, the "WB" takes but little space and requires no outside piping—installation is simple.

Check your compressor—it may need replacement. Replace with Gardner-Denver and be assured of dependable, low-cost service. For complete information, write the Gardner-Denver Company, Quincy, Illinois.

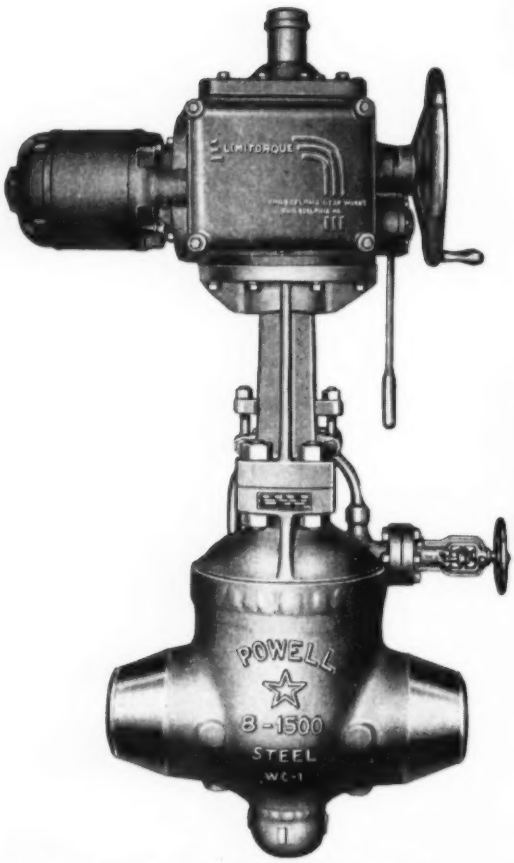
GARDNER-DENVER

Since 1859

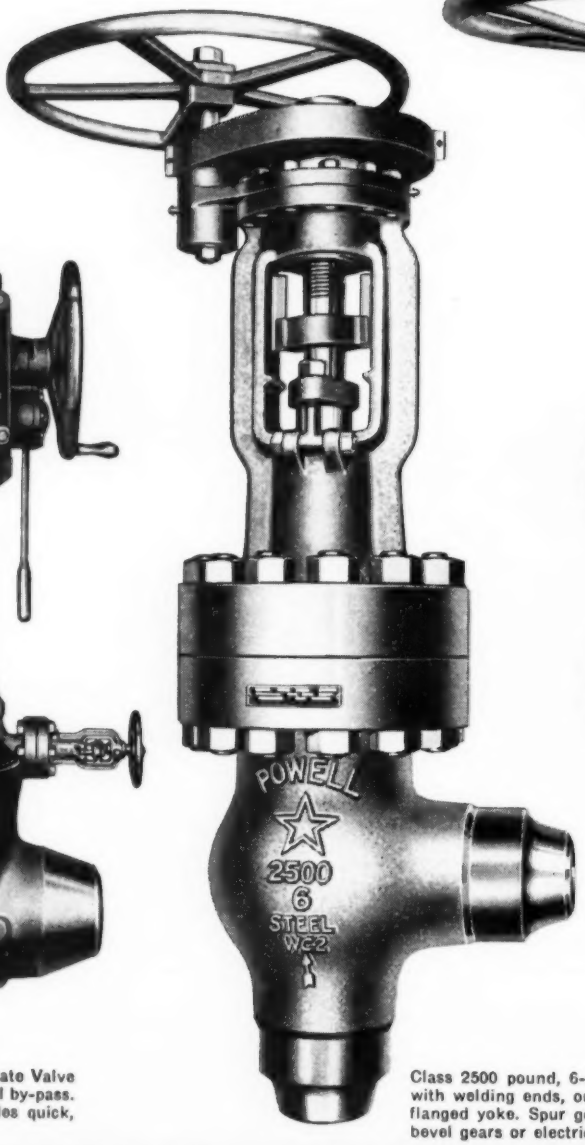


Gardner-Denver Two-Stage Vertical Water-cooled Compressor. Capacity 142 to 445 cubic feet per minute.

For assured performance, the valve must suit



Class 1500 pound, 8-inch Cast Alloy Steel Gate Valve with welding ends, welded bonnet and special by-pass. Top-mounted electric motor operator provides quick, positive opening and closing.



Class 2500 pound, 6-inch, Cast Alloy Steel Angle Valve with welding ends, outside screw rising stem and bolted flanged yoke. Spur gear operated. Can be equipped with bevel gears or electric motor operator.

Class 900-pound, 10-inch, Cast Alloy Steel Non-return Angle Valve, with welding ends. Spur gear operated. Powell Non-return valves are available also with bevel gear, toggle or motor operation.

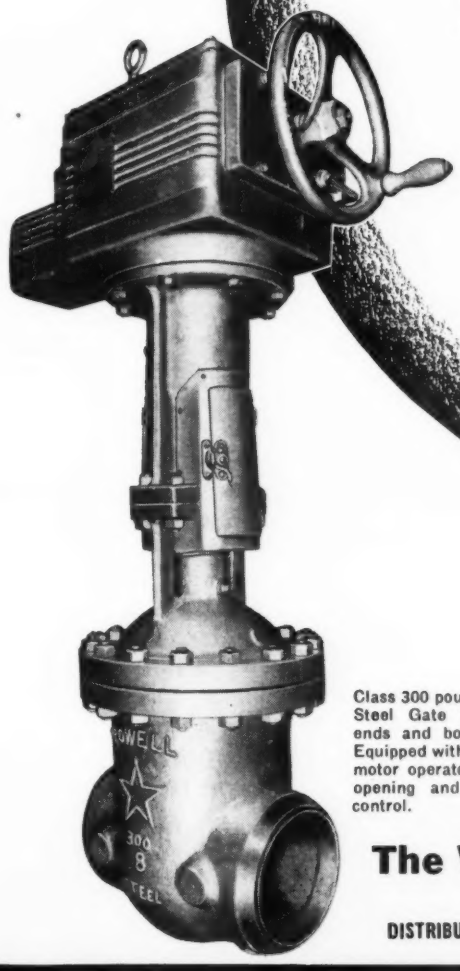
POWELL

the service!

For certain services, Iron Valves are fully adequate. In others, Bronze Valves are especially suitable. And, in many installations, Steel Valves are definitely required. Moreover, the modern trend toward higher and higher pressures and temperatures in power installations has imposed many new demands for special flow control equipment. As always through 100 years of making valves for Industry, Powell Engineers have met every challenge.

Today, in addition to complete lines of Bronze and Iron Valves of every required type and size and Cast Steel Valves of all types in pressure classes from 150 to 2500 pounds, Powell can furnish valves designed to meet special requirements of the modern power plant. A few are shown here.

In writing for catalogs, kindly state your requirements. Powell Engineers will be glad to help you select the correct valves to *suit the service.*



Class 300 pound, 8-inch Cast Alloy Steel Gate Valve, with welding ends and bolted flanged bonnet. Equipped with top-mounted electric motor operator for quick, positive opening and closing by remote control.

Class 1500 pound, 6-inch Cast Alloy Steel Gate Valve with welding ends and welded bonnet. Bevel gear operated.

The Wm. Powell Company
Cincinnati 22, Ohio
DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

VALVES

★ ★

Management And Maintenance Prefer SAND-BANUM

"The Entirely Different Boiler and Engine Treatment"

The men in direct charge of boiler maintenance prefer Sand-Banum because it comes ready to use.

Is easy and simple to handle—harmless to personnel and equipment.

Is applied only once a week; unaffected by age, climate, water or operating conditions.

Management prefers Sand-Banum because it keeps boilers clean, resulting in increased operating efficiency, fewer shutdowns, longer equipment life, and fuel economy.

Safe
Simple
Certain
Write for Proof

AMERICAN SAND-BANUM COMPANY, Inc.

9 Rockefeller Plaza New York City 20

Stocks carried by
WESTERN SAND-BANUM COMPANY
Houston, Texas
and at other convenient points including leading supply houses.

Export Representatives:
PETROLEUM MACHINERY CORP.
30 Rockefeller Plaza New York City 20

★ ★

61 TUBE FITTINGS—Flodar Corp, 331 Frankfort Ave, Cleveland 11, O. 8-page catalog No. 101 presents Grip Tube Series of tube fittings. These tube fittings, which are available in ⅛ to 2 in. tube sizes, may be reused repeatedly.

62 PIPE THREADS — Weatherhead Co, 300 E 131st, Cleveland 8, O. 8-page booklet contains information which explains what Dryseal pipe threads are, how they work and recommended practices. It also carries charts and drawings of interest to engineers, designers and purchasing agents.

63 STAINLESS-STEEL VALVES—Alloy Steel Products Co, Linden, N. J. 4-page bulletin tells why Aloyco stainless-steel valves are preferred by some leading companies. 4-page bulletin No. 2 gives technical information on Aloyco-20, a corrosion-resistant alloy.

64 CONTROL VALVES—Hanna Engrg Works, 1765 Elston Ave, Chicago 22, Ill. Three 4-page folders describe Hanna Unitite Jr control valves, Hanna 2-direction speed-control valves and Hanna foot-operated valves.

PRIME MOVERS AND ACCESSORIES

65 STEAM TURBINES—Elliott Co, Jeannette, Pa. 20-page bulletin No. Q-12 covers Elliott equipment for power plants and industrial processes, ranging from team turbines, motors, generators and feedwater heaters to turbochargers, steam jet ejectors and centrifugal blowers.

66 CONDENSER TUBE INSERTS—Condenser Service & Engrg Co, 95 River Street, Hoboken, N. J. 8-page bulletin describes Flowrites, metal inserts for inlet ends of condenser tubes, which prevent tube-end erosion. Bulletin gives report of tests conducted at Massachusetts Institute of Technology, with tables, graphs and data showing how condenser operation is improved with Flowrites. Installation instructions are included.

67 DIESEL GENERATORS—Consolidated Diesel Electric Corp, 230 E 8th St, Mt. Vernon, N. Y. 4-page bulletin No. CD-101 contains important facts about stationary and portable power generator sets and portable floodlight units, plus a long list of their uses and advantages.

68 STEAM-TURBINE LUBRICATION — Gulf Oil Corp, 3800 Gulf Bldg, Pittsburgh, Pa. 20-page booklet, entitled "Gulfcrest Oil for Steam Turbine Lubrication," gives operating characteristics and advantages of this oil. Booklet includes a picture story of the Alchlor process.

69 DIESEL NOZZLE TESTER—Buda Co, Harvey, Ill. 4-page bulletin No. 1238 describes Buda's universal diesel nozzle tester. It is a low-cost portable tool that will test all makes and models of diesel nozzles and injectors.

70 CONDENSER WATER SCREENS—Chain Belt Co, 1600 W Bruce St, Milwaukee 4, Wis. 44-page bulletin No. 46-3 presents complete line of Rex sanitation and liquid clarification equipment. Rex products described include screens for condenser water, conveyor sludge collectors and Tow-Bro sludge removers, grit collectors and washers, Verti-Flo thickeners, skimmers, Aero-filters, Floctrol, rapid mixers, gravity waste water-oil separators.

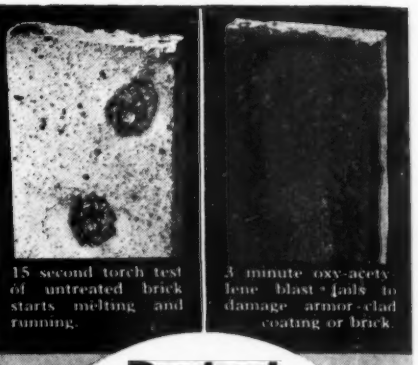
71 DIESEL-GENERATOR PLANTS—Kato Engrg Co, Mankato, Minn. 8-page form No. 1245 discusses diesel generators and gasoline engine-driven generators. Dimensions and weight of each model are included. Photographs illustrate equipment.

72 DIESEL ELECTRIC POWER UNITS—Diesel Motors Corp, Port Washington, L. I., N. Y. 8-page booklet and single sheet describe all-purpose portable diesel electric power units. Capacities, dimensions and prices are given.

PUMPS

73 HYDRAULIC PUMPS—Aldrich Pump Co, Allentown, Pa. 60-page bulletin No. 50 contains hydraulic information and tables, along with a resume of Aldrich manufacturing facilities and a condensed catalog of products.

74 PUMPS—Worthington Pump & Machinery Corp, Harrison, N. J. 16-page reprint No. RP-275 covers reciprocating steam pumps, how they compare with other


15 second torch test of untreated brick starts melting and running.
3 minute oxy-acetylene blast fails to damage armor-clad coating or brick.

Protect furnace walls WITH ARMOR-CLAD (MONOLITHIC COATING)

Armor-Clad effectively shields new or old fire-walls, jambs, arches, burner rings, baffles, and impingement areas from deteriorative influences

No furnace, regardless of type of fuel or application—industrial, stationary, marine or metallurgical—should be fired without ARMOR-CLAD protection of firewalls. Providing vitreous coating protection of all surfaces, ARMOR-CLAD eliminates destructive actions of slag adhesion, flame or hot gas penetration and chemical attack. Positive impervious sealing of cracks, joints, pores and interstices assures long-lasting, efficient performance. Application is simple and economical.

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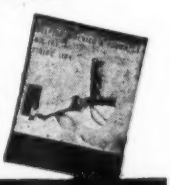
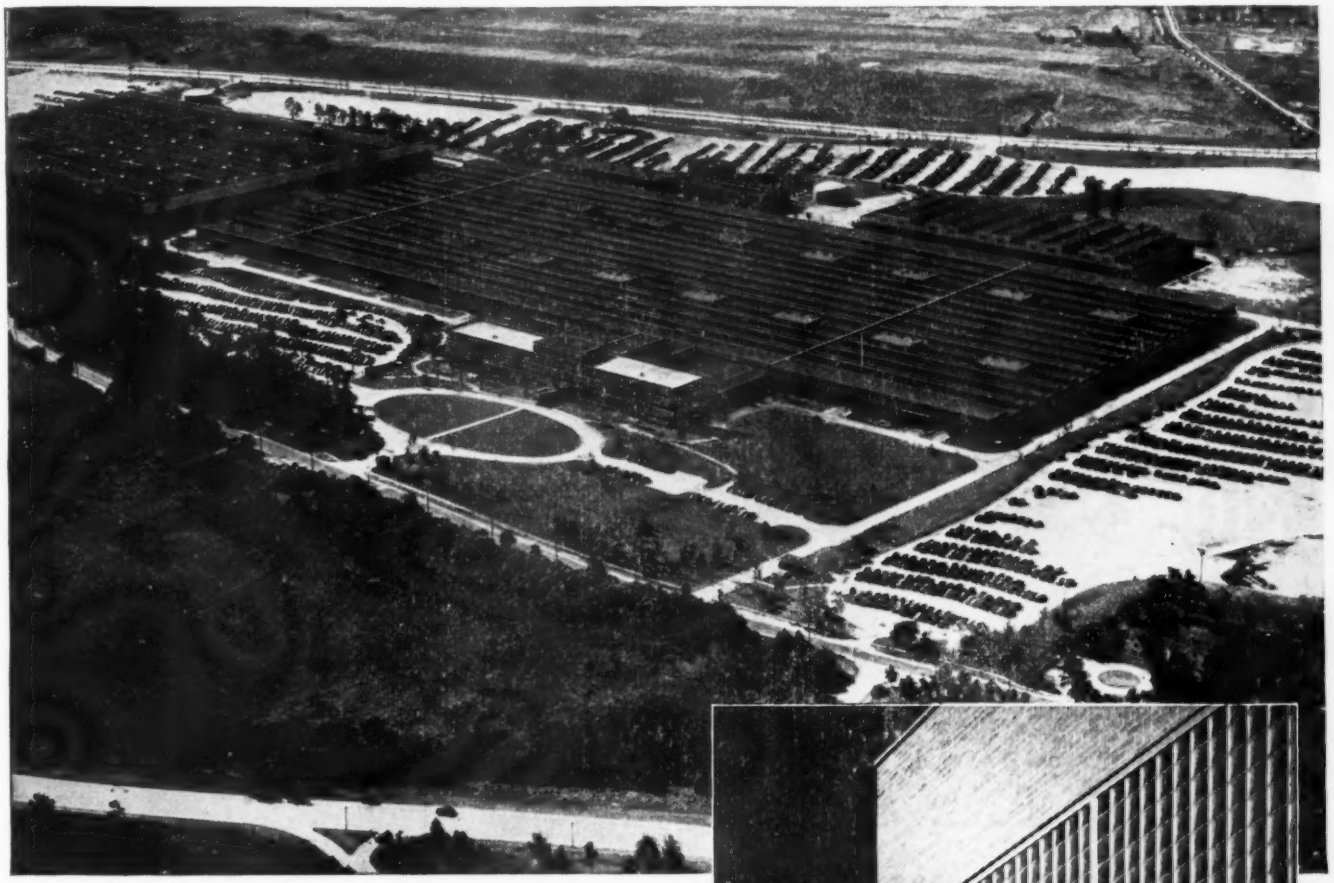
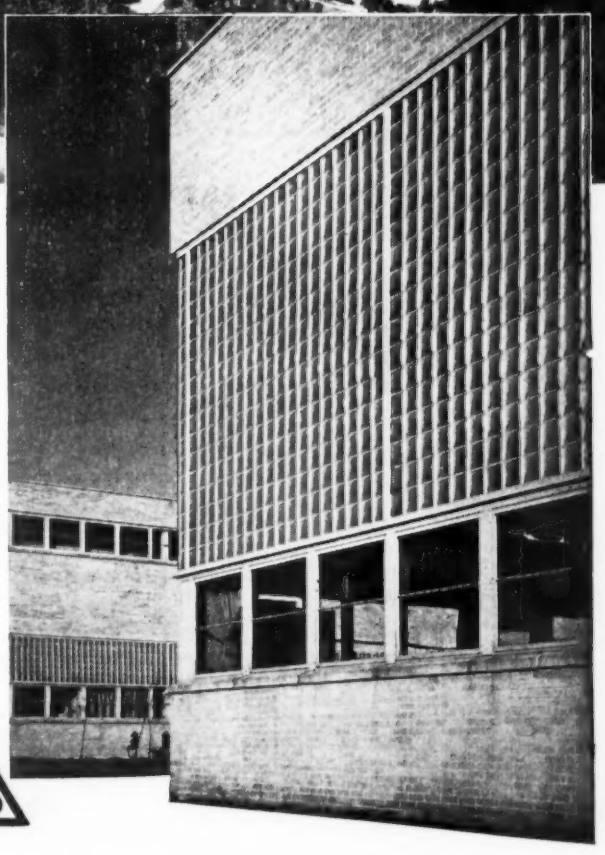
For full information write today for ARMOR-CLAD'S informative brochure. No obligation is incurred.



ARMOR-CLAD COMPANY
Refractory Protection
39 HYATT AVE., NEWARK 5, N. J.

WHERE THE BOMBSIGHTS GREW



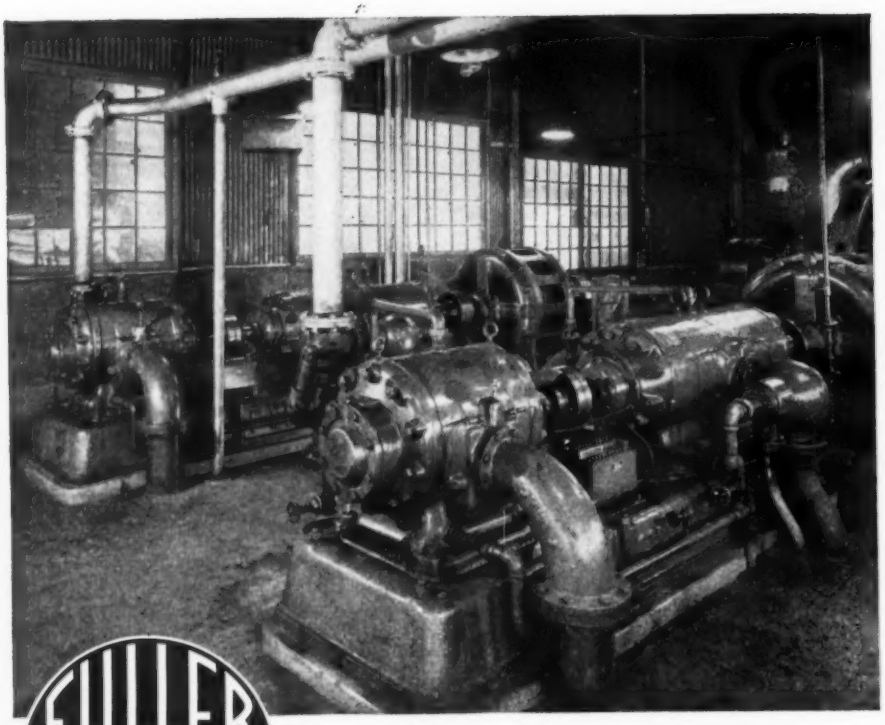


Utility and beauty are combined in the Nassau Plant where bombsights and other vital war precision instruments and equipment were manufactured by Sperry Gyroscope Co., Inc. The plant is modern and functional in design to assure maximum efficiency and comfortable working conditions.

Designed and built by Stone & Webster Engineering Corporation.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.



FULLER ROTARY COMPRESSORS

Two Fuller Rotary Two-Stage Compressors. Capacity each, 1665 c. f. m., 100-lb. pressure.

Another Steel Mill Installs Fullers

Write for Bulletin C-5

Steel mill superintendents have learned that Fuller Rotary Compressors really fill the bill in their business. Hundreds of them are now in use throughout the industry. They're easy to install, don't require large, heavy foundations with relation to capacity when compared with other types of compressors. Then too, Fullers give them the original capacities for the life of the machine.

Fullers have a minimum of moving parts, only three: rotor - bearings - blades. Really built for severe service. And, when repairs are necessary, easy access to the machine allows the work to be done with minimum time loss.

FULLER COMPANY

CATASAUQUA, PENNSYLVANIA

Chicago 3 - 1144 Marquette Bldg.
San Francisco 4 - 421 Chancery Bldg
Washington 5, D. C. - 618 Colorado Bldg.

C-127

FULLER

PIONEERS OF HIGH-EFFICIENCY ROTARY COMPRESSORS

kinds and their design limitations. Photographs, cross-section views and diagrams are included with article. 8-page bulletin No. W-414-B50 gives advantages, sizes and ratings of Variflo triplex power pumps. 8-page reprint No. RP-292, entitled "Speed and Temperature Corrections for Centrifugal Boiler Feed Pump Efficiencies," covers the subject thoroughly.

75 **FLOW PUMPS**—Marco Co, Wilmington 50, Del. 12-page catalog gives features of Flow-Master pumps. These pumps are adaptable for transferring, metering or proportioning products. Construction details, sizes, capacities and prices of each model are included.

76 **MIDGET PUMPS**—Eastern Engrg Co, New Haven, Conn. 20-page catalog discusses line of midget pumps and laboratory stirrers. It consists of descriptions and illustrations of many new models both for regular industrial application and special designs recently developed.

77 **CENTRIFUGAL PUMPS** — Ingersoll-Rand Co, 11 Broadway, New York 4, N. Y. 16-page form No. 7100, entitled "The Shaft-Seal—The Answer to Your Stuffing Box Problems," contains a graphic description of the Cameron Shaft-Seal. Booklet is full of cross sections, exploded views and pictures of Shaft-Seal installations.

WATER TREATMENT

78 **INDUSTRIAL FILTERS**—Blackburn-Smith Mfg Co, 95 River St, Hoboken, N. J. 8-page catalog covers two designs of filters. The Refiner, a pressure leaf filter, is for extremely fine filtration and for removal of emulsified and free oil from condensate, down to .01 parts per million. Standard water filter and grease extractor, an industrial and marine filter for general service, is for where emulsified oil is not present in the condensate, or where high-quality mineral oils are in suspension.

79 **CONDUCTIVITY CELLS** — Industrial Instruments, Inc, 17 Pollock Ave, Jersey City 5, N. Y. Catalog provides a comprehensive survey of conductivity checking equipment for laboratory and plant application. This literature deals primarily with a wide selection of conductivity cells for checking of various liquids under varying conditions.

80 **WATER STRAINER**—S P Kinney Engineers, Inc, 233 Oliver Ave, Pittsburgh 22, Pa. 4-page folder describes Brassert self-cleaning water strainer, capacities, training media and other engineering data covering the latest design.

81 **CHEMICAL TREATMENT**—W H & L D Betz, Gillingham & Worth St, Philadelphia 24, Pa. Booklet explains functions and method of operation of consulting div of W H & L D Betz. Included in this booklet are seven architectural flow diagrams giving a cross section of various problems encountered and how these problems were solved. These flow diagrams embrace plants for softening water for industrial use, waste treatment, sewage disposal and pre-treatment of water for boiler purposes and others.

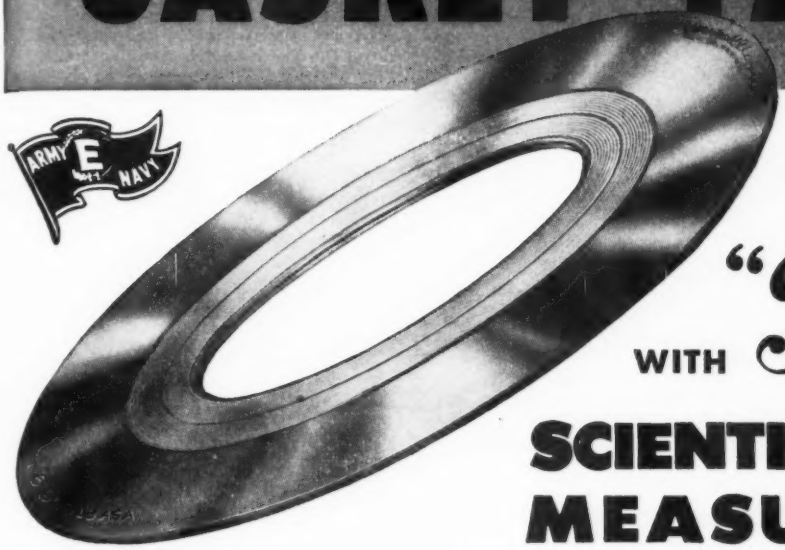
82 **PHOTOELECTRIC COLORIMETER**—Photovolt Corp, 95 Madison Ave, New York 16, N. Y. 32-page folder discusses Lumetron photoelectric colorimeter Model 450 for Nessler tubes. This is a new photoelectric instrument for water analysis and other tests requiring accurate measurement of faint colorations and turbidities.

WELDING

83 **WELDING FITTINGS** — Tube-Turns Inc, Louisville, Ky. 6-page folder, entitled "It's Your Move," contains an isometric drawing visualizing many applications and kinds of piping in which Tube-Turn welding fittings can be used for piping connections.

84 **COPPER ALLOY WELDING** — C E Phillips & Co, 2750 Poplar St, Detroit 8, Mich. 32-page handbook, entitled "Welding and Brazing of Copper and Copper Alloys," is divided into three divisions. Introductory section gives definitions of materials and processes, accompanied by a table of compositions and properties of welded and brazed commercial copper alloys. Second section discusses each of the common copper alloys individually. Final section is devoted to welding and brazing materials for copper and copper alloys.

AVOID COSTLY GASKET FAILURE



WITH "Flexitallic" REG. U. S. PAT. OFFICE

SCIENTIFIC MADE-TO-MEASURE DESIGN

Style C-G..COMPRESSION RING TYPE

Safe, sure sealing members for raised-face, smooth-face, Van Stone or Cranelap fittings.

Style D SELF-CENTERING TYPE

A continuation of the spiral metal winding serves as a perfect guide to proper centering of the gasket.

In addition to the types illustrated, Flexitallic Gaskets are available in styles and sizes for practically every pipe flange and pressure vessel requirement.

Whether your sealing problem involves high-pressures, high-temperatures, shock or vibration, corrosion, or chemicals, Flexitallic Spiral-Wound Gaskets can solve it. Moreover, the slightly higher cost resulting from engineering gaskets specifically to the application is more than repaid by easier installation and elimination of costly maintenance.

Exclusive high-speed precision methods permit Flexitallic Gaskets to be wound to more exacting, scientifically-determined tolerances than any in the industry. Exclusive construction features evolved through more than a third of a century of spiral-wound gasket specialization offer absolute assurance of maximum strength with minimum seating area *plus* the all-essential resiliency to meet changing line conditions. Catalog on request. Better yet, send details of your application for a specific recommendation by Flexitallic engineers.

FLEXITALLIC GASKET CO.
8th & BAILEY STS. · CAMDEN, N. J.

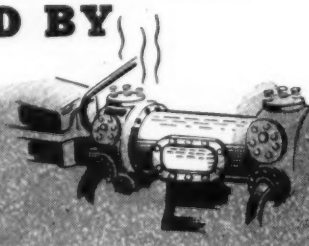
THE ANSWER TO 1001 DIFFICULT GASKET PROBLEMS

HEAT-PROOF **SHOCK-PROOF** **LEAK-PROOF**

ANY TEMPERATURE—ANY PRESSURE (INCLUDING 2500 LBS. A.S.A. SERIES)

FRANCE
Metal Packing
STOPS SHUTDOWNS
CAUSED BY

Leakage...



Worn Rods...

Loss of Power...

FRANCE
Type G Fan Company
PHILADELPHIA 35, PA.

REPRESENTATIVES IN PRINCIPAL CITIES

85 ELECTRODE HOLDER—Tweco Products Co, English at Ida, Wichita 7, Kan. 12-page 1946 Twecolog folder presents complete information on new line of Twecotong insulated and semi-insulated electrode holders. Price and parts list is included.

OTHER EQUIPMENT

86 AUTOMATIC SEPARATORS—Leavitt Machine Co, Orange, Mass. 16-page booklet describes Dexter automatic separators for removing water, oil and dirt from compressed air lines. Booklet includes data on selection, operation and installation of these separators.

87 HEAT EXCHANGERS—Griscom-Russell Co, 285 Madison Ave, New York 17, N. Y. 16-page bulletin No. 1614 discusses the Twin G-Fin Section, which has been characterized as a universal heat exchanger because of its many applications in cooling, heating, condensing and heat exchange services. 4-page bulletin No. 1250 contains more than 20 illustrations with concise descriptions of evaporators, extraction steam heaters, water, oil, air and gas heaters and coolers, and heat exchangers.

88 COAL SHAKER—Robins Conveyors Inc, Passaic, N. J. 8-page bulletin No. 128 presents the Robins Car Shakeout. It is an independent, readily portable unit requiring no attachments to or on the car.

89 BUCKETS—Blaw-Knox Div, Blaw-Knox Co, Pittsburgh, Pa. 40-page catalog No. 2059, superseding catalog No. 1865, covers Blaw-Knox 4-rope buckets. Buckets described are for handling coal, iron ore.

90 METAL PARTS—International Nickel Co, 67 Wall St, New York 5, N. Y. 44-page booklet, entitled "How to Find Long Life," lists suppliers of Inco nickel alloy parts and accessory equipment. This guide describes 188 items, ranging from special tower packing to nonsparking safety tools, and gives name and address of each manufacturer.

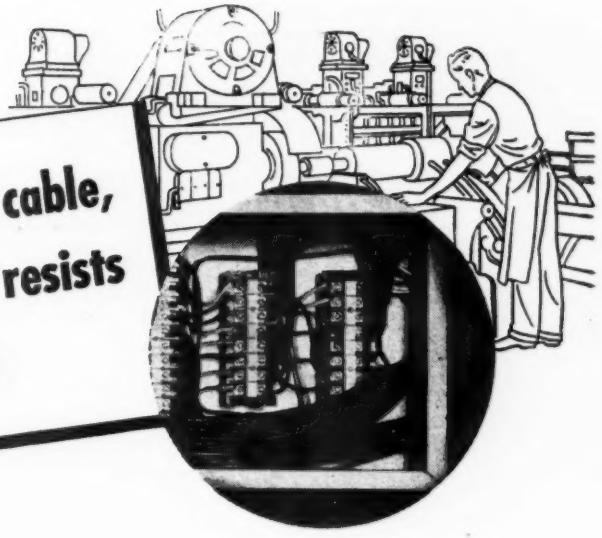
Atomic-Power War Ships Predicted by Bowen, USN

As the "greatest consumer of power in the world," the Navy could likely achieve amazing results by the installation of atomic-power plants in ships, declared Rear Admiral H G Bowen, chief of Office of Research and Inventions, at George Westinghouse centennial dinner in Philadelphia on Apr. 23.

In large vessels, he said, eliminating weight of boilers and their auxiliaries, and of thousands of tons of fuel oil, would permit thicker bottom plate and heavier armor. With nuclear power, cruising radius would be almost unlimited. New bottom paints would make drydocking unnecessary.

With fuel economy less important, turbines would be redesigned to give more power per pound to permit increased speed, to which end the underwater body of ships would be completely redesigned.

The Navy, he continued, will search for a power-pile coolant that can operate at temperatures up to 1500 or 2000 F and not become radioactive. The Navy recognizes a responsibility in the following six categories: (1) A vigorous program for propelling ships, submarines and aircraft by nuclear energy. (2) Development of nuclear munitions and vehicles to launch and carry them. (3) Utilization of nuclear studies for the medical sciences. (4) Exhaustive exploration of all possible countermeasures in nuclear physics and allied fields of science. (5) Maintenance of a broad program of research in nuclear physics and allied fields. (6) Education and training of naval personnel in nuclear energy and applications.



PROBLEM: to find insulated cable, for wiring machine tools, which resists all kinds of cutting fluids

First solved with FLAMENOL *cable*

● Not long after the introduction of Flamenol*, in 1935, a prominent manufacturer of automobiles was searching for insulated cable which would withstand machine-tool cutting oils and coolants. When a G-E sales engineer showed the manufacturer a sample of Flamenol—and described its excellent resistance to oils, water, and heat—the company's chief electrician immediately ordered 6000 feet. The company found this cable so satisfactory that it now specifies Flamenol to be installed on all the machine tools it buys. If you have a problem of finding insulated cable or wire that will withstand severe conditions, such as contact with cutting fluid, Flamenol may very likely be the answer. It has proved its many desirable properties in hundreds of power and lighting applications.

RESISTS FLAME—Flamenol does not support combustion. Thus, it prevents serious outages due to fires that involve wiring. Requiring no protective braid, it reduces the volume of wiring and eliminates terminating problems due to fraying. Flamenol's insulation strips easily and leaves the conductor surface untarnished. It is highly resistant to oils, water, mild acids and alkalis, and weather. It is tough, stable, and flexible at low temperatures, and has high dielectric strength.

A G-E "FIRST"—Only G.E. makes Flamenol wire and cable. Flamenol is the pioneer of wire and cable insulated with plasticized polyvinyl chloride. It was produced by G.E. in 1935—not as a substitute for rubber-insulated wire, but as a new type possessing desirable properties not available with rubber. To find out how Flamenol can help solve your problems—save you time, trouble, and expense—ask our local office, or write General Electric Company, Schenectady 5, N. Y.

*Trade-mark reg. U.S. Pat. Off.

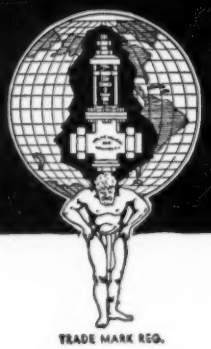
GENERAL ELECTRIC

502-52-1200

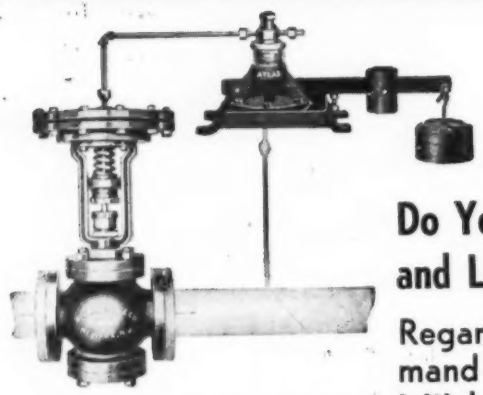
ATLAS

Super-Sensitive

PRESSURE REGULATORS



TRADE MARK REG.



Do Your Pressures and Loads Fluctuate?

Regardless of fluctuations in demand — Regardless of varying initial pressures — this ATLAS Super-Sensitive Pressure Regulator maintains controlled pressures without variation.

Write for Bulletin No. 1B Giving Complete Details

Where pressures must be maintained within fractions of one pound and without perceptible variation even where demands vary widely and initial pressures fluctuate violently—use this ATLAS Super-Sensitive Regulator. Its performance will please you. It is suitable for steam, air, gas, etc., where it is essential to maintain a constant reduced pressure in heating mains, vats, cookers, retorts, etc. It may also be applied as an altitude regulator to maintain constant level in open tanks, or as a pump governor to assure constant pump discharge pressure.

There is practically no limit to the range of applications of this remarkable ATLAS regulator. It will accurately regulate at any pressure between the initial pressure and atmosphere in one stage, operating control valves from ½" to 6".

Specify No. 801—for reduced pressures 2 to 15 lb.
" No. 801-8—for reduced pressures 0 to 5 lb.
" No. 802—for reduced pressures 15 to 150 lb.
Sizes ½", ¾", 1", 1¼", 1½", 2", 2½", 3", 4", 5", 6".

ON WHICH ATLAS PRODUCTS DO YOU WANT INFORMATION?

Check the items below on which you want complete information and mail to us with your name, firm name and address.

- ☐ Super-sensitive Pressure Regulators
- ☐ Other Pressure Regulators
- ☐ Damper Regulators
- ☐ Temperature Regulators
- ☐ Reducing Valves
- ☐ Exhaust Control Systems
- ☐ CAMPBELL Boiler Feed Water Regulators
- ☐ Pump Governors
- ☐ Float Valves
- ☐ Oil Control Cocks
- ☐ Humidity Controllers
- ☐ Thermostats
- ☐ Balanced Valves
- ☐ Control Valves

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

Specialists in Regulation for Nearly a Half Century

289 South St., Newark 5, N. J.

Representatives in Principal Cities

Appointments

(*Continued from page* 190)

will be under supervision of A R Bradshaw, Manhattan's Pacific Slope manager at San Francisco, and R G Hueman, Manhattan factory representative, who will make his headquarters at Republic to assist in solving mechanical rubber-goods problems.

Automatic Temperature Control Co names Les Hunt direct factory representative for the home-office territory. He will operate out of the factory's office at Philadelphia.

Perry G Jefferson has been made traffic manager of **Fairbanks, Morse & Co,** replacing Joseph W Elliott, who is retiring.

Ampco Metal, Inc, announces formation of a process-industry div to handle inquiries and engineering problems connected with process-industry field.

R W Biggs has been named works manager of Ambridge, Pa., plant of **National Electric Products Corp,** succeeding Neil C Lamont, who has reached retirement age.

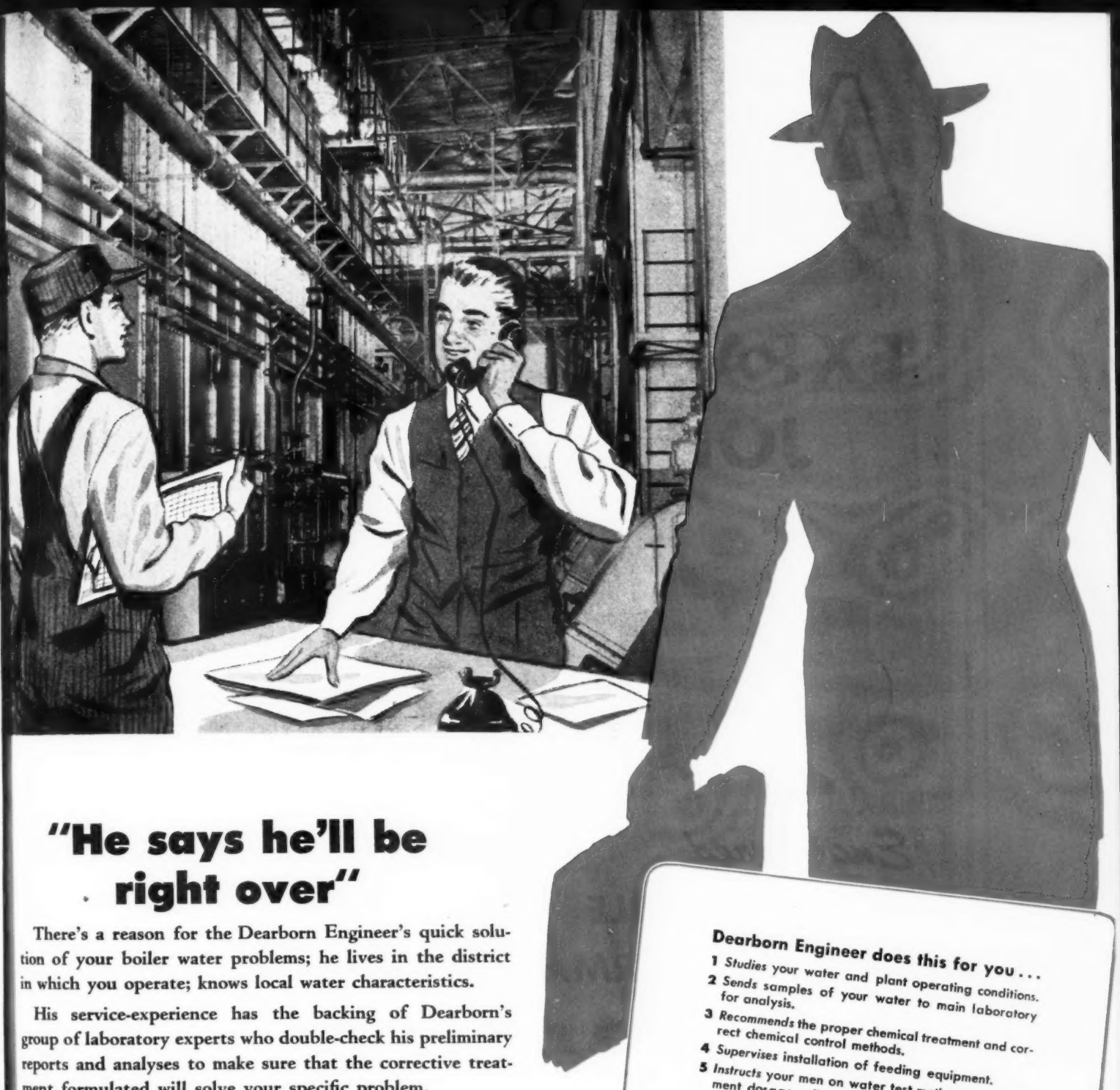
William C Decker was elected president of **Corning Glass Works,** succeeding Glen W Cole, who was made vice-chairman of board of directors. Charles D LaFollette was named treasurer and will also continue in his present position as vice-president and director of sales. Eugene W Ritter, vice-president, together with Messrs Decker and LaFollette, were added to the board. John L Ward was made manager of bulb and tubing div. Eugene C Sullivan was elected honorary vice-chairman. Jesse T Littleton was designated director of research. Directors named an executive committee of seven, all of whom are active operating officials as well as directors of the company: Amory Houghton will serve as chairman of the committee, which will include Dr Sullivan, George D Macbeth, vice-president and controller, and Messrs Cole, Decker, LaFollette and Ritter. William H Curtiss, vice-president, will serve as secretary of committee.

Dan K Heiple has rejoined **R G LeTourneau,** as field engineer in installation dept.

Detrex Corp appoints L C Kroes manager of central regional sales in Detroit.

J Paul Scheetz has joined **Rust Engrg Co** in an executive capacity.

Announcement of appointment of four divisional sales managers was made by the **Weatherhead Co:** (1) J A Strachan has been made sales manager of original equipment div covering sales of all products to original equipment manufacturers in refrigeration, air conditioning, railroad, marine, chemical, food and beverage processing and dairy fields. (2) D W Holmes becomes sales manager of standard-parts div covering all products sold through distributor channels. (3) T V Scott is the newly appointed sales manager of liquefied petroleum products div covering petroleum and LPG equipment in-



"He says he'll be right over"

There's a reason for the Dearborn Engineer's quick solution of your boiler water problems; he lives in the district in which you operate; knows local water characteristics.

His service-experience has the backing of Dearborn's group of laboratory experts who double-check his preliminary reports and analyses to make sure that the corrective treatment formulated will solve your specific problem.

Call the Dearborn Engineer today. He's prompt in an emergency; always on the job to help you maintain maximum steam production.

Dearborn Engineer does this for you . . .

1 *Studies* your water and plant operating conditions.
2 *Sends* samples of your water to main laboratory for analysis.
3 *Recommends* the proper chemical treatment and correct chemical control methods.
4 *Supervises* installation of feeding equipment.
5 *Instructs* your men on water test methods for treatment dosage adjustment and blowdown control.
6 *Calls* regularly at your plant to insure maintenance of the recommended conditions.

Dearborn
TRADE MARK REGISTERED

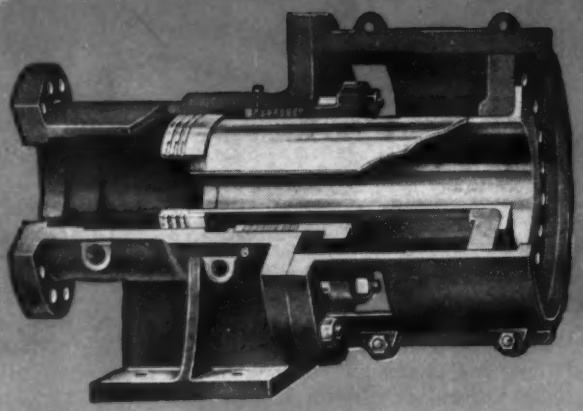
WATER TREATMENT AND ENGINEERING SERVICE

THE LEADER FOR OVER HALF A CENTURY

DEARBORN CHEMICAL COMPANY
Dept. D, 310 S. Michigan Ave., Chicago 4, Ill.

ADSCO

EXPANSION JOINTS



Engineered for **RELIABLE PERFORMANCE**

● Every man responsible for the installation, performance and maintenance of steam, hot water, oil and gas lines should have complete data on ADSCO Expansion Joints. Available in single and double joints for high pressure and high temperatures,—flanged and bevelled ends.

The ADSCO Piston-Ring Expansion Joint illustrated above makes it possible to add packing without shutting down the system. It is another outstanding example of ADSCO advanced engineering.

Write for Catalog No. 35-PR

AMERICAN DISTRICT STEAM CO.
NORTH TONAWANDA, N.Y.
MAKERS OF UP TO DATE STEAM LINE EQUIPMENT FOR OVER 65 YEARS

dustries. (4) L C Doolittle heads the aviation div as sales manager of all products to original-equipment manufacturers in aviation, machine tool, metals processing and machinery fields. All will be in Cleveland.

Allen-Bradley Co moves their Boston office to larger quarters at 55 Oliver St. M H Hallenbeck remains as district manager, supported by Charles M McCoombe.

W A Davies has joined **Consolidated Industries, Inc,** as regional-sales manager. He will be in charge of sales for Va., Md., Del., N. C., and S. C. Jack Blake was named purchasers director for company. Vernon L Beery will be in charge of field service and installation in stoker div.

Bardco Mfg & Sales Co elected George Castera president, succeeding the late Fred Jervis. John E Walters is vice-president and sales manager. Walter J Ashton is sales manager of snow div, manufacturing irrigation gates and valves.

Ansul Chemical Co changed name of Dugas div to fire-extinguisher div.

Timken Roller Bearing Co formed a div of research and development to replace the old experimental dept. This div is under management of J F Leahy, who supervised the experimental dept.

Cinch Mfg Corp purchased Howard B Jones Co, 2460 W George St, Chicago. This plant will be known as the Howard B Jones div and will continue the manufacture of Jones plugs, sockets, terminal strips, fuse mounts, etc. Cary Wilson, vice-president of Cinch Mfg Corp, heads the manufacturing of the new organization as general manager.

Gasflux Co announces appointment of Douglas C Ogilvie as eastern div manager, with headquarters at 487 Orange St, Newark 7, N. J. He will provide field service for the accounts of distributors in New England, eastern N. Y., eastern Pa., N. J., Del. and Md. Chas W Krieg Co will continue to handle the distributorship of Gasflux units and Gasflux in N. J. and New England.

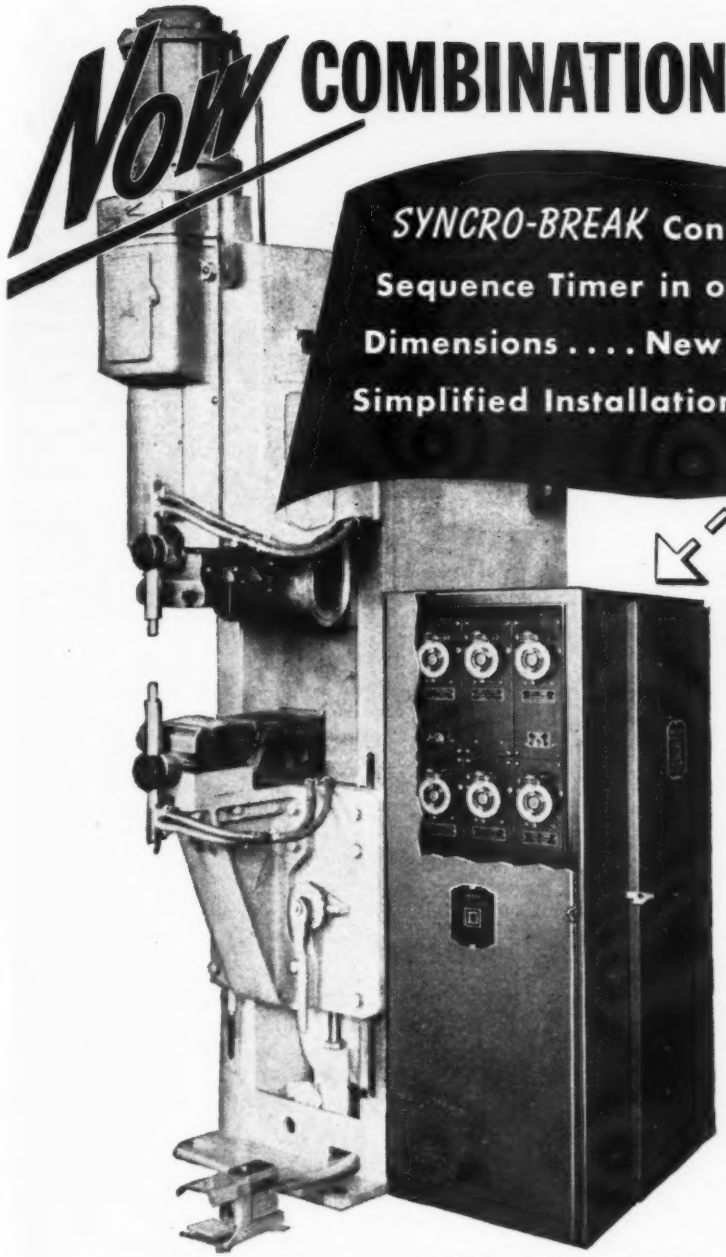
Appointment of J T Myers as assistant general manager of **Davey Compressor Co** was announced. H W Lewis Equipment Co became Davey distributors for southern Tex.

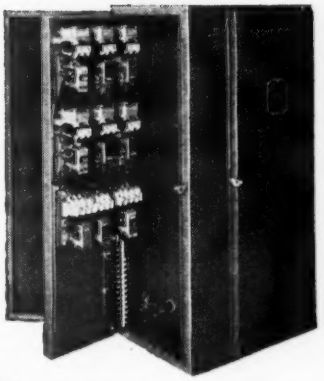
Edgar Stanton was named service and advertising manager of industrial div at **Belden Mfg Co.** He will report to Henry Neil, sales manager of industrial div. Following men have been graduated from the sales-trainee program of merchandise div and have been assigned territories: Warren Stuart will represent the company in Calif., Kerby Garrett in Tex. and Okla., and John McEwen in N. Y. and New England. Harold Hofman has been transferred to Pacific coast. Robert D Shawl will call on jobbers in La., Miss., Ark. and Tenn.

Formation of **David Gordon & Co,** chemical and mechanical engineers, was announced. This company offers engineering services to domestic and foreign industry on entire projects or selected portions of

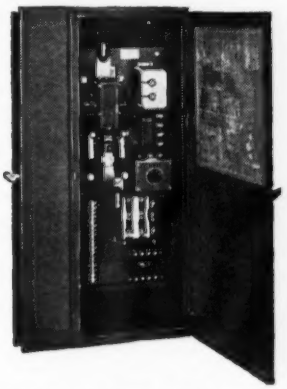
Now COMBINATION WELDER CONTROL

SYNCRO-BREAK Contactor and *Safront* Weld Sequence Timer in one enclosure . . . . Standardized Dimensions . . . . New Safety Features . . . . Greatly Simplified Installation . . . . Improved Appearance





Safront panel swung out to show timing and sequencing relays. Adjusting dials are on front of this panel for maximum safety. Separable connector strip allows easy removal of panel for installation or maintenance.



Side door gives access to contactor, control fuses, and all line, load, and control terminals. *SYNCRO-BREAK* rheostat is mounted on extended bracket to bring adjusting knob out beyond live parts.

1. Complete automatic control system in one cabinet—necessary control fuses, terminals, transformers, etc. included.
2. Specifically designed to meet new standards and recommendations of RWMA and machinery builders.
3. Front location puts dials within easy reach to facilitate machine set-up or time adjustments.
4. Depth standardized at 20 inches, width kept within 15 inch maximum.
5. Foot switch, pressure switch, no-weld switch and timer control circuits are 110 volts for added operator safety.
6. Panel space provided for low voltage control or two-position foot switch auxiliaries.

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Advertisement

Rugged Pump Does "Sweet" Ash Handling Job at Beet Sugar Refinery . . . . . .

During recent years, with the supply of cane sugar seriously curtailed, beet sugar refineries have been busier places than ever before.

An important phase of beet sugar production is the fundamental one of steam generation. The more sugar produced, the greater the steam demand, and consequently the greater the volume of ashes to require disposal.

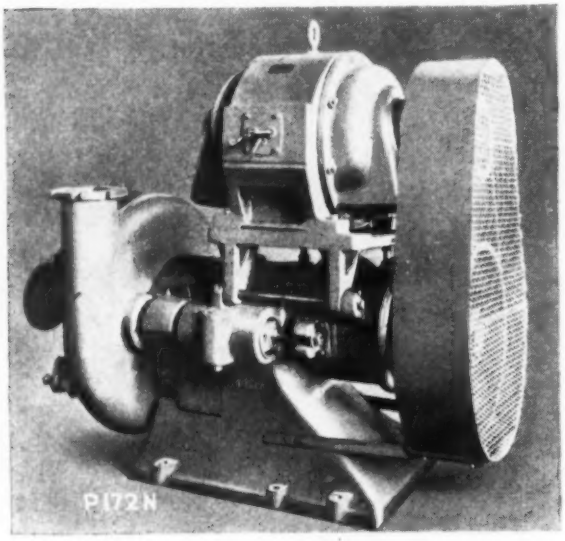
Handling ashes with pumps can be the most economical and satisfactory method, provided the pump has what it takes to withstand severe abuse. Ashes suspended in solution are brutally abrasive, and water end parts of ordinary metal will not long withstand the wear involved. Too, the pump must be correctly designed for this service.

Amsco-Nagle horizontal centrifugal pumps have all the qualifications for handling ashes, and are being installed for that purpose in a steadily growing list of boiler plants. This pump, from its very inception, was intended to handle abrasive materials and is built for operation under the most severe service conditions, in addition to meeting the requirements of high mechanical and hydraulic efficiency. Simplicity and ruggedness, so highly important where frequent servicing or replacement are apt to be necessary, are design features of Amsco-Nagle pumps.

The water end parts are made of manganese steel which experience has proved is unequalled for wear in such applications as handling ashes. Impellers especially designed for ash handling have been evolved.

Picture P-172-N shows a 6" Type "T" frame 19 Amsco-Nagle pump for handling ashes in a beet sugar refinery. The overhead motor conserves floor space.

Amsco-Nagle centrifugal pumps are available in sizes from 6" to 16". Write for latest literature.



6" Type "T" Amsco-Nagle pump used for ash disposal in a Michigan beet sugar refinery. The water end parts have what it takes to withstand the abrasive wear of handling ashes.

Joliette Steel, Limited, Joliette, Quebec, Owned by American Brake Shoe Company, Produces and Sells Amsco Manganese Steel Castings in Canada.

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such projects involving process development, plant design, procurement of equipment and materials, construction and operation. Its officers are Samuel G Adams, chairman of board; Albert de Chiara, president; David Gordon, executive vice-president; Warren L Walsh, treasurer and secretary.

American Transformer Co announces a new operational plan and personnel appointments. The new plan divides functions and responsibilities into three major classifications. Exercising top management functions are Thomas M Hunter, president and treasurer; Walter Garlick Jr, vice-president; John M Wollmer, comptroller and secretary; and William R Smith, works manager. John F Harris supervises electronics and aircraft products, Walter Hoehn power, distribution and liquid-filled transformers, and Theodore W Stauber specialty air-insulated transformers and *Transtats*.

D A Sutch was named general superintendent of Clinton plant of **Wickwire Spencer Steel,** succeeding G G Lloyd, who was recently transferred to Buffalo as general plant superintendent.

Ralph Wann was elected a director of **Colorado Fuel & Iron Corp.**

Claude L Draper has been confirmed for membership on **Federal Power Commission** by a unanimous Senate vote.

Louis C McCabe joined the **Bureau of Mines** staff as chief of coal div of fuels and explosives branch, Washington, D. C. C P Bowie retires as supervising engineer of Petroleum Field Office at San Francisco.

Bituminous Coal Research, Inc, announces addition of Carl S Westerberg to its Pittsburgh office staff. He succeeds Ralph H Hopp who resigned last year. William S Major has been made development engineer.

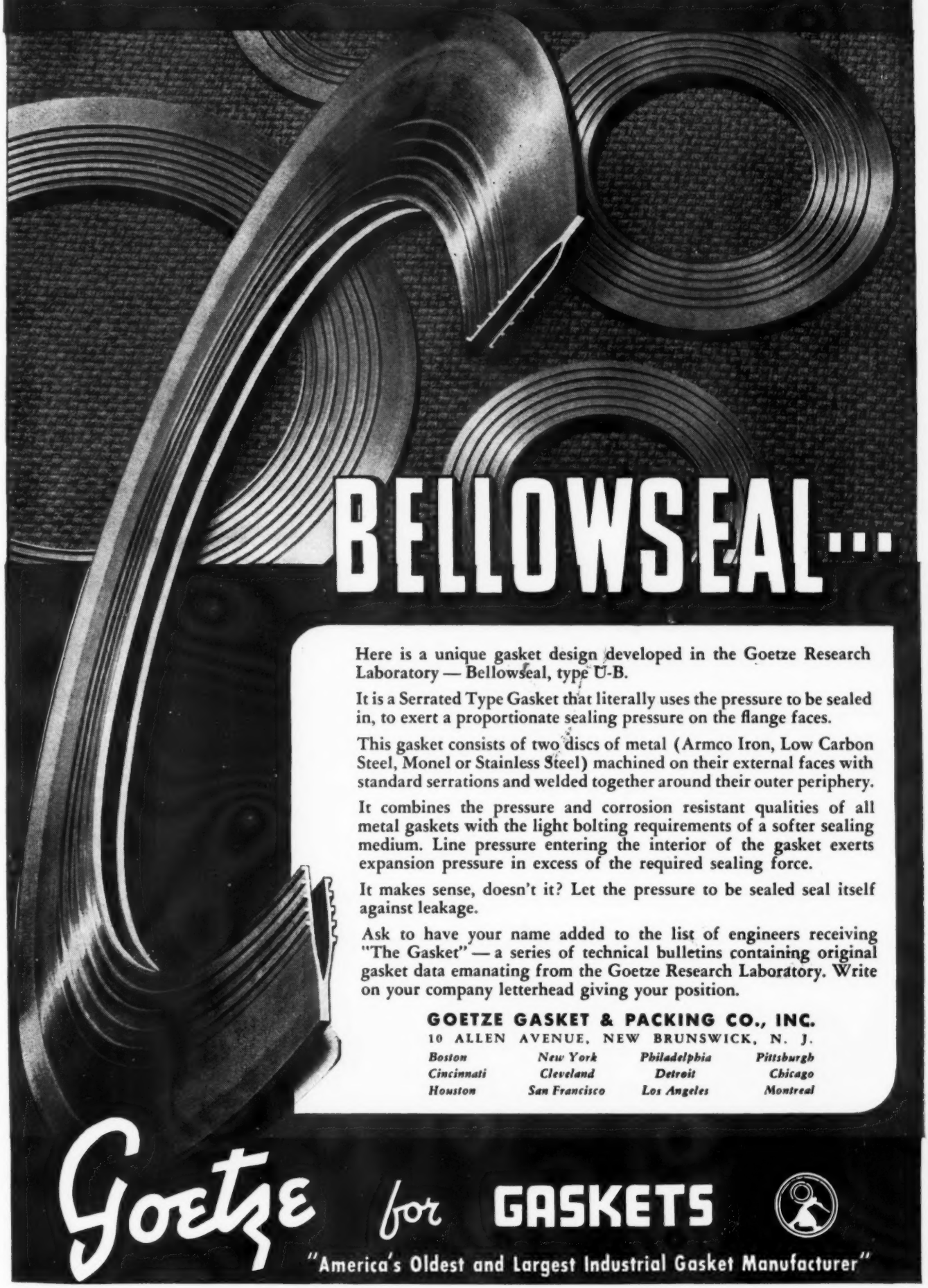
Paul B Mueller, power-plant equipment and construction, opens his office at 1033 Metropolitan Life Bldg, Minneapolis.

Howard E Cousins, a director and manager of Boston office of **Lockwood Greene Engineers, Inc,** was made a vice-president.

Establishment of a School of Engineering at **University of Buffalo** and appointment of Prof Paul E Mohn as its dean was announced. The new school will be housed in engineering building under construction.

A M Sargent, Pioneer Engrg Co, Detroit, was elected president of **American Society of Tool Engineers.** Mr Sargent is succeeded as first vice-president by W B Peirce, vice-president, Flannery Nut & Bolt Co, St. Louis, Mo. Elected second vice-president was T P Orchard, general manager, American Tool Engrg Co, New York, N. Y. Named third vice-president was Irwin F Holland, general superintendent, small tool and gage dept, Pratt & Whitney div, Niles-Bement-Pond Co, Hartford, Conn. R B Douglas, works manager, propeller div, Canadian Car & Foundry Co, Ltd, Montreal, Que., and regional director from eastern Canada, was named national secretary of the society. V H Eric-

MODERN DEVELOPMENTS OF GASKET RESEARCH



BELLOWSEAL...

Here is a unique gasket design developed in the Goetze Research Laboratory — Bellowseal, type U-B.

It is a Serrated Type Gasket that literally uses the pressure to be sealed in, to exert a proportionate sealing pressure on the flange faces.

This gasket consists of two discs of metal (Armco Iron, Low Carbon Steel, Monel or Stainless Steel) machined on their external faces with standard serrations and welded together around their outer periphery.

It combines the pressure and corrosion resistant qualities of all metal gaskets with the light bolting requirements of a softer sealing medium. Line pressure entering the interior of the gasket exerts expansion pressure in excess of the required sealing force.

It makes sense, doesn't it? Let the pressure to be sealed seal itself against leakage.

Ask to have your name added to the list of engineers receiving "The Gasket" — a series of technical bulletins containing original gasket data emanating from the Goetze Research Laboratory. Write on your company letterhead giving your position.

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HERE is a combined "Megger" Insulation Tester and Wheatstone Bridge that has been proved by years of service, and that can be used to measure almost any resistance encountered in electrical equipment—anywhere and at any time. It measures conductor resistance from as low as .01 ohm up to 999,900 ohms, and can be supplied withVarley loop test facilities. It measures insulation resistance from 10,000 ohms up to 200 megohms. Having a self-contained constant pressure generator rated at 250, 500 or 1000 volts d-c, it is independent of batteries or outside source of power supply, and is portable, compact and simple to operate.

To all who have electrical equipment to install or to maintain, and who appreciate the advantages of one superior instrument for all resistance measurements, we recommend and offer the "Bridge-Meg" Resistance Tester. Weight 14 lbs. Dimensions 7" x 8¾" x 12".

For complete description write for Bulletin 1615-P.

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son, vice president, Johnson de Vou, Inc, Boston, was elected treasurer, with W Dawson, F F Barber Machinery Co, Ltd, re-elected as assistant secretary-treasurer. Harry E Conrad was re-elected executive secretary.

American Society of Tool Engineers elected following directors: A J Denis, R B Douglas, Irwin F Holland, Thomas P Orchard, W B Peirce, A M Sargent, A M Schmit, Grant S Wilcox Jr, C B Cole and A G Collins.

C A Joerger, University of Cincinnati faculty member since 1913, becomes dean of **College of Engineering** Sept 1, 1946, after serving as acting dean from Mar 1 through Aug 31, succeeding Robert C Gowdy. Dr Gowdy will be on leave of absence during this six months' period, retiring Sept 1 because of poor health. Prof Howard K Justice was named assistant dean and director of admissions in College of Engineering.

Engineering Institute of Canada elected J B Hayes, manager of Nova Scotia Light & Power Co, president.

A Edward Simpson has started an electrical engineering business at 850 W Hastings St, Vancouver, B. C., Can.

OBITUARIES

Gustave Fast, 61, president of Fast Bearing Co and Gustave Fast Engrg Co, Salisbury, Md. died May 9 at Reading, Pa.

Vere Buckingham Edwards, 56 president of Dravo Corp, Pittsburg, died May 8 at offices on Neville Island.

Henry Kreisinger, 69, director of research for Combustion Engrg Co and authority on fuels, died at Columbia Presbyterian Medical Center, New York City, on May 7.

Frederick Hoffmeister, retired erecting engineer of Canadian General Electric Co and prominent in electrical and power fields in U. S. and Canada for many years, died April 13 at Niagara Falls, Ont.

William Carter Dickerman, 71, member of executive committee and board of directors of American Locomotive Co and American Car & Foundry Co, New York, N. Y., and director of many other leading corporations, died April 25 at his home in New York City.

James Williams, shop superintendent of Terry Steam Turbine Co, Hartford, Conn., died Mar. 18.

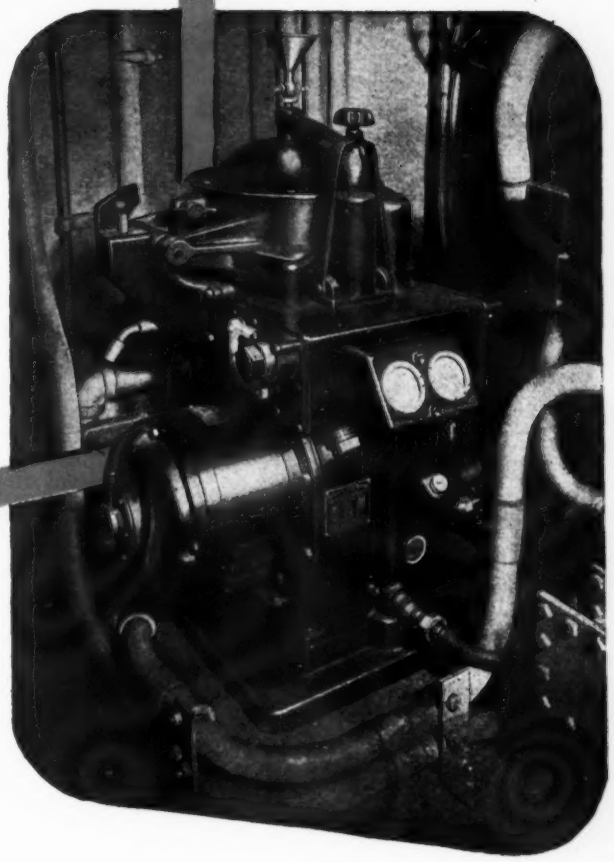
Alfred S Davis, 64, for the past 12 years head of steam-plant engineering for New England Power Service Co, Boston, died at Waban, Mass., on Apr 7.

James A Ahearn, 77, manager of Cambridge, Mass., factory of Worthington Pump & Machinery Corp, from 1915 until his retirement in 1929, died at Belmont, Mass., on Apr 5.

Charles W Wager, 65, chief engineer of Eastman Kodak Co's power dept at Kodak Park, Rochester, N. Y., died recently.

Richard Brown, 51, chief engineer of steam stations, Boston Edison Co, died at Wellesley Hills, Mass., on Apr 29.

Certainly, REMOVE THE DIRT- *but remove* THE WATER TOO!



WHEN purifying turbine lubricating oil, choose a De Laval Oil Purifier to get rid of ***both*** of these troublemakers instantaneously and continuously. To do a half-way job of oil purification is like carrying half an umbrella in a storm—it is really no protection at all. For water, more than any one other thing, contaminates turbine oil. Condensate leads directly to the formation of sludge, and should a major water leak develop in the turbine serious emulsification trouble would soon occur. Such dangers are eliminated when a De Laval centrifugal is part of the lubrication system.

Solid foreign matter, too, is instantaneously removed and stored in the bowl, outside of the zone of purification.

In short, De Laval Oil Purifiers keep oil so clean that its purity can best be compared with that of new oil.

De Laval centrifugals do not remove oil-soluble additives. Because the separation of oil and water and other impurities is effected entirely by mechanical means, the oil loses none of these additives in passing through the Purifier.

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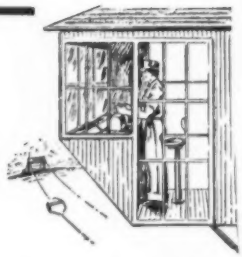
DE LAVAL *OIL PURIFIERS*

FOR MORE DEPENDABLE POWER PRODUCTION



In his station overlooking stockpile, operator has "push-button" control of entire operation of scraper, including travel of tail tower seen in background.

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ALL your coal storage
when you are equipped with

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SCRAPER SYSTEM

ONLY ONE MAN, with finger-tip control, stores and reclaims coal easier and faster, whether you store a few cars per day, or many. Makes cleaner, safer piles *at a BIG saving*. Costs only a few cents per ton handled!

Other advantages of Sauerman equipment: Maximum tonnage stored in all available space —stocks in compact layers—no air pockets for spontaneous combustion—low installation cost —simple and economical to maintain.

You might have DOUBLE the amount of coal stored for the present emergency, if you had the Sauerman Scraper System. Be prepared!

Large Sauerman Crescent scraper bucket ranges across pile 400 ft. wide and reclaims coal to ground hopper at rate of about 5 tons a minute.

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More and More Power Engineers Specify

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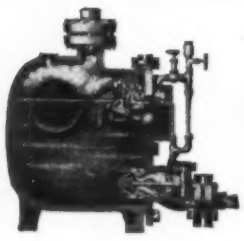
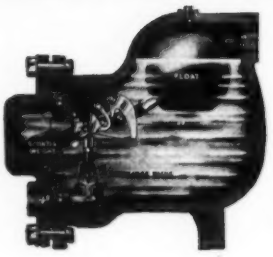


Heavy-Duty
TRAPS
FOR



→*High Pressures*

Rugged units that can take necessary abuse, Nicholson weight- and piston-operated traps are setting records as efficiency promoters, due to their enormous drainage capacity and rapid intermittent action. Types for steam, air, gas, gasoline—for all power and process applications. Pressures to 1,500 lbs. Catalog 444 details exclusive features that explain why more and more power engineers are specifying Nicholson traps. It merits a ready place in your reference files.

Catalog 444 or See Sweet's

W. H. NICHOLSON & CO.

125 OREGON ST., WILKES-BARRE, PA.

Supercharged Diesels

(*Continued from page* 70)

ing air. The sole new problem lay in reducing by suitable port design resistance to air flow at comparatively high pressures while still maintaining turbulence needed for good combustion of fuel quantities greatly in excess of those in an unsupercharged engine of the same dimensions. Problems of starting, increased bearing loads, cylinder wear and good combustion proved only questions of design based on past experience with engines of conventional types.

Tests were run over a number of years on a series of engines each designed to try out a particular problem. Fig. 4 shows the first of these engines to be built as a combined unit with turbine geared to engine and supercharging air supplied by direct-driven reciprocating pumps. Fig. 5 gives test results of this engine. Other engines were described in the *Sulzer Technical Review*, Dec. 1941.

RANGE OF TESTS

Investigations were carried out on a series of single- and opposed-piston engines with cylinder bores ranging from 4.75 to 19 in., and at rates of supercharge from 28.5 to 85 psia. Piston speeds between 1200 and 2400 fpm were tested. Short tests only were run at the high figure of 85 psia supercharge. on two engines. Longer tests were run at lower rates, about 28.5 psia. Maximum piston speed was tested for half an hour on one engine. Runs at extreme rates of supercharge and piston speed aimed only at checking ultimate engine output limits, and there was no thought that these figures might be used normally.

In general, combustion characteristics of these highly supercharged engines proved excellent, making it possible to burn heavy fuel oils with smoke-free exhaust. For supercharging, reciprocating pumps and both axial- and radial-flow rotary compressors were tested, with and without intermediate cooling. A 6-cylinder opposed-piston engine had a turbine and rotary blower geared to the engine through a hydraulic coupling. Both single- and multi-stage exhaust turbines, Fig. 6, were tested.

On the basis of these trials, work began on a 4000-hp marine engine suitable for a merchant ship. It is now running and will have extensive shop tests, to be followed, it is hoped, by trials in a ship. This engine, Fig. 7, has six horizontally opposed cylinders of 12.6-in. bore and 2x15.75-in. stroke. The two crankshafts gear to a common main wheel to be

PROOF FROM A PARKER ENGINEER'S NOTEBOOK

You can save time, money and materials with Parker Fluid Power Engineering.

The actual case record pictured is typical. Our recommendation enabled this manufacturer to cut down on number of connections, on space and avoid leakage. Moreover, his customer got a better job—one that operates more efficiently, is easier to service.

We've solved many a manufacturer's problems with equally simple recommendations—using standard Parker equipment. For unusual conditions of design, where stock parts will not serve, we are able to supply "custom-bilt" valves and couplings. In every case the result has been the same—a simplified installation. May we show you how Parker Fluid Power Engineering can do the same for you?

Stocks Available at your Distributor's and at Parker Warehouses

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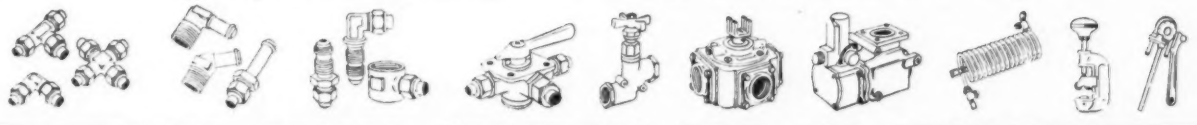

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YOU'LL SAVE

on hose units which must be carried in stock

The speed and ease with which PACKLESS couplings can be applied permits the purchase of flexible metal hose in mill lengths and cutting to size as you need it. There's no need to buy and stock various lengths, complete with fittings, for making quick replacements.

And you save on couplings too . . . because the PACKLESS detachable fitting can be re-used indefinitely. No soldering or brazing employed in assembling hose and coupling.

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flexible metal hose with detachable couplings

A-2328

coupled to the propeller shaft. This synchronizes the crankshafts and gives a 4 to 1 reduction from 440 to 110 rpm. Crankshaft-driven reciprocating pumps supply supercharging and scavenging air; supercharge pressure is 28.5 psia. Although test engines at the same supercharge rate carried 170-psi bmep, or more, it was decided to limit the rating on this engine for marine work to 150 psi, allowing an overload margin of 20%. The exhaust turbine connects through a hydraulic coupling and first reduction gear to the main gear between crankshafts. For astern running, exhaust is taken directly from the engine through a throttle bypass; astern power is about 60% of full-ahead power. Fig. 8 shows preliminary test results.

LIGHT-WEIGHT ENGINE

A lighter-weight engine for special services is also under construction. It will have eight vertical cylinders of 7.1-in. bore and 2x8.5-in. stroke. At 37 psia supercharge, 1000 rpm, 1475-fpm piston speed and 175-psi bmep it will develop 2500 bhp continuously. At its one-hour rating of 2850 bhp at 200 bmep, engine weight is 7 lb per bhp.

In this unit, a rotary axial-flow compressor couples directly to the exhaust turbine, both being connected through a hydraulic coupling and gears to the lower engine shaft. With no need for making the engine reversible, choice of a rotary compressor saves complication, because to get required compact design with reciprocating compressors would have required 16 cylinders arranged in V-form around the lower crankcase.

Tests are also being made at high rates of supercharge on 4-cycle engines, which are equally adaptable and may present less difficulty. In the past, supercharging rate of 4-cycle units with an exhaust turbocharger appears to have been limited by exhaust temperature but this can be overcome by coupling the supercharger to the crankshaft, as with the 2-cycle engine, making it possible to supply additional scavenging air and thus lower the exhaust temperature. However, it is felt that for really high ratings and large outputs, supercharging the 2-cycle engine is the principal line of development.

Two-cycle supercharging has now reached the stage where, subject to long-term service experience, it may be considered practicable to operate at charging pressures of 28 to 43 psia and bmep's of 170 to 215 psi. For these pressures, rotary compressors, if used, must be of multistage design. In general, simplicity of design dictates single-stage turbines although multistaging might improve fuel consumption.

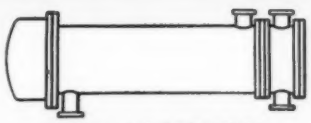
To obtain

MAXIMUM DISTILLED WATER with MINIMUM STEAM

use...

A MULTIPLE EFFECT G-R EVAPORATOR SYSTEM

ONLY G-R BUILDS THIS WIDE VARIETY OF HEAT TRANSFER APPARATUS



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Heaters, Coolers, Condensers, Heat Exchangers

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Longitudinal-finned elements for greater heat conductivity

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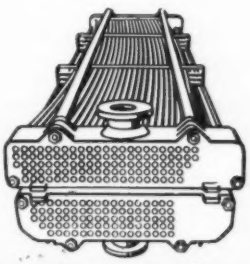


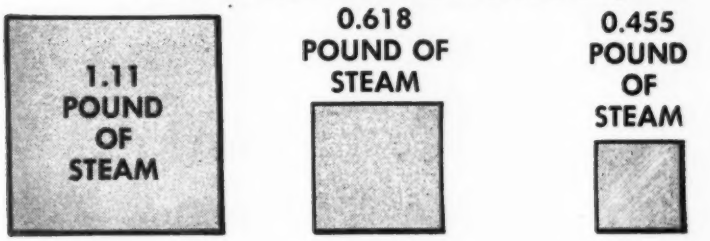
BENTUBE EVAPORATOR
Scale-shedding Elements

TUBEFLO SECTIONS
Non-clogging design for residuum and other dirty fluids

The amount of steam required to produce a pound of pure distilled water — by single effect and multiple effect evaporators — is diagrammatically shown below.

The greater thermal efficiency of a multiple effect system produces more distillate per pound of steam — a great advantage in plants requiring a large percentage of boiler feed make up with a minimum of available steam.

1 POUND OF DISTILLED WATER Requires



IN 1 - EFFECT EVAPORATOR PLANT

IN 2 - EFFECT EVAPORATOR PLANT

IN 3 - EFFECT EVAPORATOR PLANT

A more complete explanation of multiple effect evaporator systems, and other factors involved in the decision of the most economical method of producing pure distilled water or vapor for individual plant requirements — are fully discussed in Bulletin 364 which will be sent without obligation on request.

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REMOVES SOOT & FIRE-SCALE WHILE BOILERS OPERATE

CHIPPING AND SCRAPING ARE UNNECESSARY when you use XZIT. Simply feed XZIT into the firebox while the boilers operate. When thrown on the fire in a furnace it forms a gas which permeates all parts of the boiler, the uptakes, and the stack, and has a chemical reaction on the soot and fire-scale.

XZIT can be used to extinguish stack fires and to stop sparking. Regular use keeps boilers and stacks clean and free of soot and fire-scale.

Used by all industries for better boiler operation and for improved furnace operation — XZIT is a proved product. Write for demonstration or order a trial supply. There is an XZIT representative near you.

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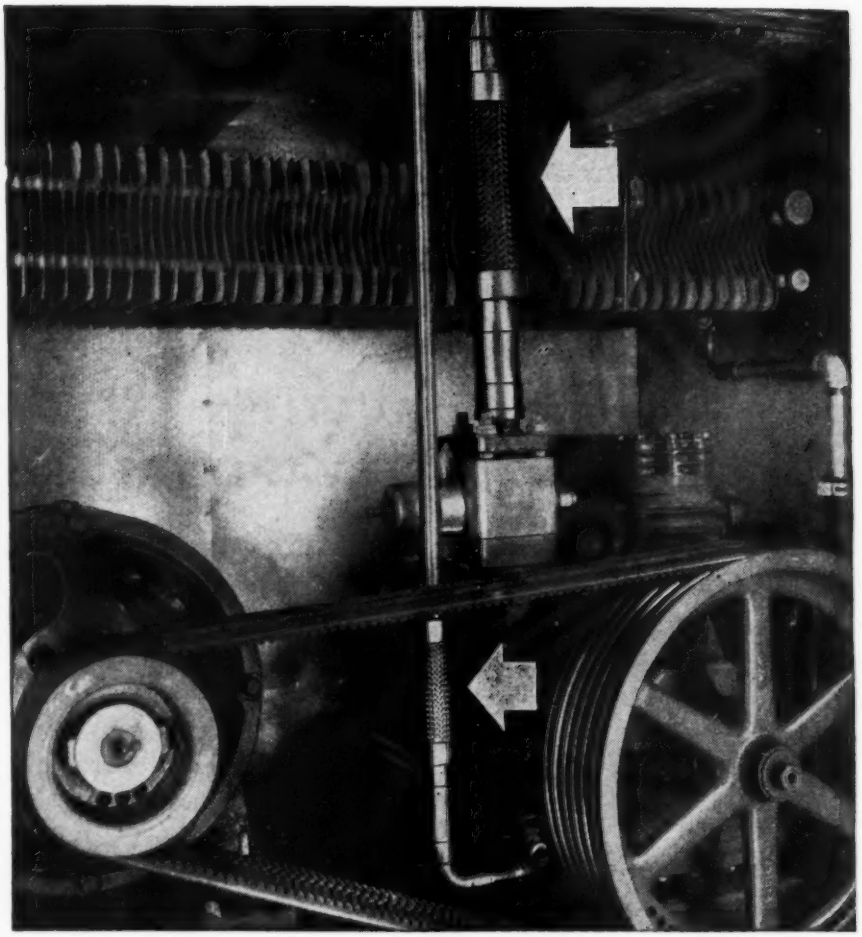

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Reduce Vibration Hazards

REX VIBRA-SORBERS—properly installed—substantially reduce servicing costs. For **REX VIBRA-SORBERS** have the exceptional strength and flexibility needed to absorb prolonged vibration and thus prevent the transmission of noises throughout the entire piping system.

In addition, **REX VIBRA-SORBERS** are pressure-tested to insure "refrigerant-tightness." This means greater protection against leakage of valuable refrigerants. **REX VIBRA-SORBERS** of copper bearing alloy are normally used for Freon and Menthol. Units of steel alloys are available for ammonia. Thus, effective corrosion resistance is assured in all types of installations.

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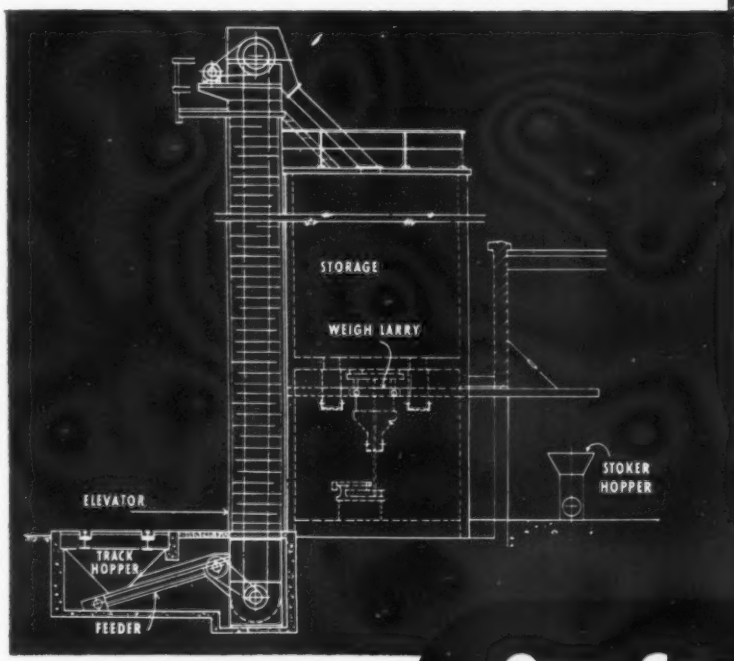
MAYWOOD, ILLINOIS
Plants: Maywood and Elgin, Ill.



One Coal-Handling System Does Many Jobs

G-W Bucket Elevator and Coal Storage Pocket

(Below) G-W Drag Feeder delivers coal from railroad track hopper to boot of bucket elevator

This is a typical G-W coal handling system that has been erected many times—with but slight modifications—to meet widely varying conditions in specific boiler plants. Vitrified tile or concrete storage pockets are filled from track hopper by feeder and bucket elevator. Coal is transported from storage to stokers by weigh larry or screw conveyor.

G-W does the job from design to installation—shoulders all details—assumes all responsibilities. G-W has specialized in this complete service for 130 years. Gifford-Wood Co., 420 Lexington Ave., New York 17; 565 W. Washington St., Chicago 6; Factory: Hudson, N. Y. Write Dept. I.

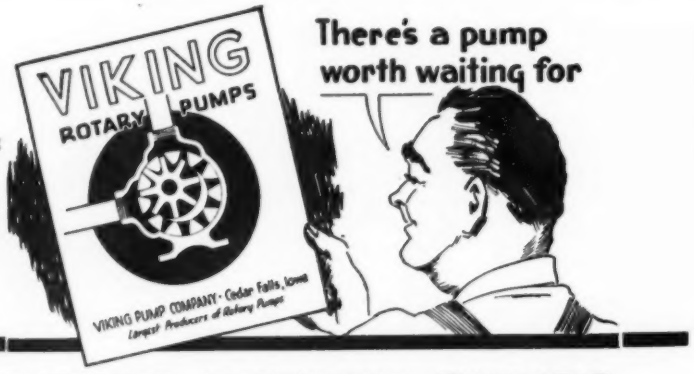
HANDLING HEADQUARTERS

for industrial conveying systems . . .
for ice processing and handling equipment . . .
for infra-Red baking and drying systems . . .

G-W HANDLES IT . . .
faster • easier • cheaper

⊕ 1520

GIFFORD-WOOD
SINCE 1814


VIKING
ROTARY PUMPS
VIKING PUMP COMPANY · Cedar Falls, Iowa
Largest Producers of Rotary Pumps
There's a pump worth waiting for

VIKING ROTARY PUMPS

"I know I will have to wait to get my Viking Rotary Pump, but I've used Vikings for many years and I know they really deliver the goods."

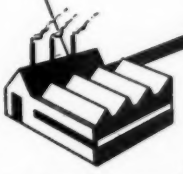
To the man who has been waiting for a Viking we say: They are coming faster and faster. Work on the tremendous backlog of orders is going on, day and night. The situation is improving. And please remember, everything is being done to deliver your pumps just as fast as possible.

In the meantime, ask for free bulletin 46-SW. It gives you the latest information on Viking Rotary Pumps.

See Our Catalog In SWEETS

VIKING PUMP COMPANY
CEDAR FALLS, IOWA

RANAREX* CUTS FUEL LOSS!



You can eliminate guesswork, cut "up the stack" heat loss by as much as 20%, when you measure CO_2 in your flue gases with Ranarex. This accurate instrument shows you exactly when combustion is regulated to the point that gives the utmost power from your fuel.

Ranarex is simple to operate, rugged (contains no chemicals) and gives quick readings, accurate within 3/10 of 1%.

For free booklet on this valuable fuel-saver, write to The Permutit Company, Dept. R6, 330 W. 42nd St., New York 18. In Canada: Permutit Co. of Canada, Ltd., Montreal.

*Trademark Reg. U.S. Pat. Off.

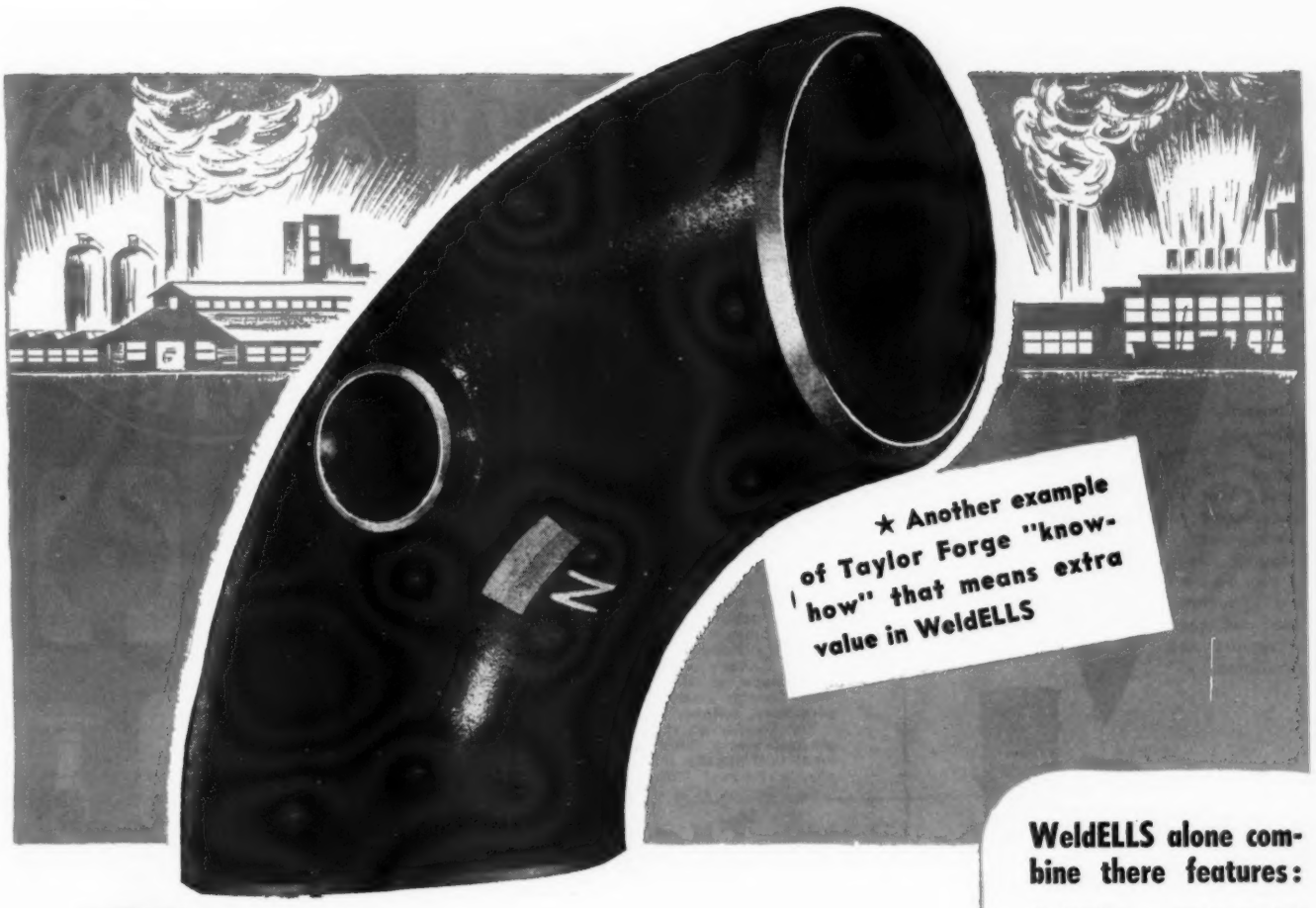
PERMUTIT'S
RANAREX
FOR GAS ANALYSIS

Manpower GONE—

need help on Ash Removal?

• Get the help you need by installing the fully pneumatic Beaumont "Vac-Veyor" ash handling system. Conveys ashes, clinkers, soot from pits, chambers and stack to storage silo with minimum of power and labor. No dust. No "wetting" of materials. Continuous operation. Installation as simple as running a pipe line. Low first cost. Low operating cost. Minimum critical materials required. For details—write:

BEAUMONT BIRCH COMPANY
1502 RACE STREET PHILADELPHIA 2, PA.
DESIGNERS • MANUFACTURERS • ERECTORS OF COAL AND ASH HANDLING SYSTEMS



They don't come much more special

★ You won't find a welding fitting like this listed in anybody's catalog. In addition to having integrally formed side walls, probably never before provided in a welding elbow, these are "special" all the way — special steel, special size and special wall thickness.

★ Every one of the hundreds of problems like this that we have tackled and solved across the years has added its important bit to our knowledge of controlling hot metal under pressure and impact. And this accumulated "know-how" has found its best expression in our standard line of WeldELLS and other Taylor Forge Welding Fittings.

That is why you find features in WeldELLS that are not combined in any other welding fittings . . . tangents . . . extra metal distributed where strains are greatest . . . extremely accurate dimensions . . . just to mention a few that call for special processes and complete knowledge of forging technique.

Check the list of features opposite and you will agree that in everything conducive to sound engineering and utmost economy in pipe welding—

WeldELLS alone combine there features:

- **Seamless** — greater strength and uniformity.
- **Tangents** — keep weld away from zone of highest stress—simplify lining up.
- **Precision quarter-marked ends** —simplify layout and help insure accuracy.
- **Selective reinforcement**—provides uniform strength.
- **Permanent and complete identification marking**—saves time and eliminates errors in shop and field..
- **Wall thickness never less than specification minimum** — assures full strength and long life.
- **Machine tool beveled ends** — provides best welding surface and accurate bevel and land.
- **The most complete line of Welding Fittings and Forged Steel Flanges in the World**—insures complete service and undivided responsibility.

WeldELLS have everything

TAYLOR FORGE & PIPE WORKS, General Offices & Works: Chicago, P.O. Box 485
New York Office: 50 Church Street • Philadelphia Office: Broad Street Station Bldg.

ADAMANT
FIRE BRICK CEMENT

MAKES STRONG THIN LININGS THAT LAST LONGER

Adamant Jo'nts are highly resistant to flame, heat and destructive gases; lengthen life of furnace wall; reduce time and cost of repairs and rebuilding.

Bonding strength maintained throughout entire temperature range: by test, 800 lbs. at room temperature; 1270 per square inch at 2600° F.

BOTFIELD REFRACTORIES CO.
786 S. Swanson St., Philadelphia 47, Pa.
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TASGON
A LIGHTNING-FAST RUST SOLVENT!

Loosens frozen couplings

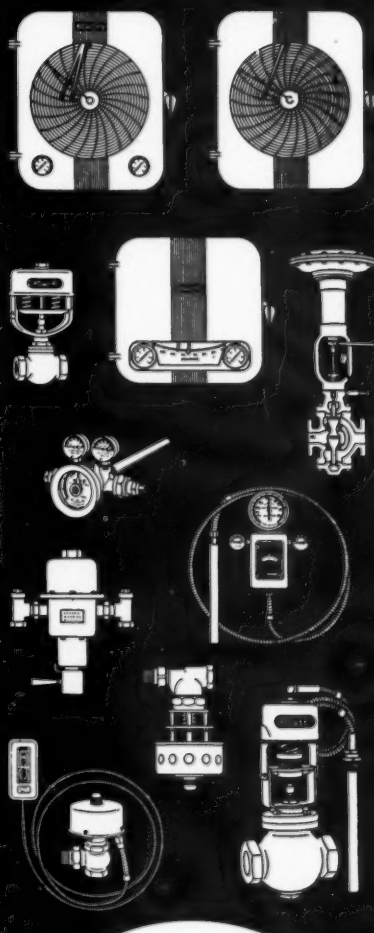
Cleans rusty tools

A fast and *efficient* rust solvent that keeps machines free of rust, gummed oil, tar, or paint. It cleans and lubricates all contact surfaces. Penetrates the tightest joints! Keeps tools free from rust! A few drops of this remarkable oil will *immediately* loosen frozen nuts, bolts, couplings, unions, and bushings.

Try Tasgon on the toughest job you've got and watch the results? Buy it at your local mill supply house or send for sample to Samuel Cabot, Inc., 1602 Oliver Bldg., Boston 9, Mass.

TASGON

POWERS
TEMPERATURE and HUMIDITY
CONTROL



When you want accurate and dependable automatic temperature or humidity control for Industrial Processes, Heating or Air Conditioning Systems, call in a Powers engineer. With over 50 years of experience and a very complete line of self-operating and air operated controls we are well equipped to fill your requirements.

Write for Circular 2520
2771 Greenview Ave., Chicago
Offices in 47 Cities—See your phone directory.

THE POWERS REGULATOR CO.

FOR SAFETY
STRENGTH
DURABILITY

USE MITCO
OPEN STEEL
FLOORING

The square-edge, uniformly spaced metal bars provide a non-slipping surface; the rectangular spacings and 90% open area permit maximum lighting and ventilation.

■ Of pressure formed construction, there are no welds to weaken, no rivets to loosen, no bolts to rust—no dirt-catching nor light-obstructing projections.

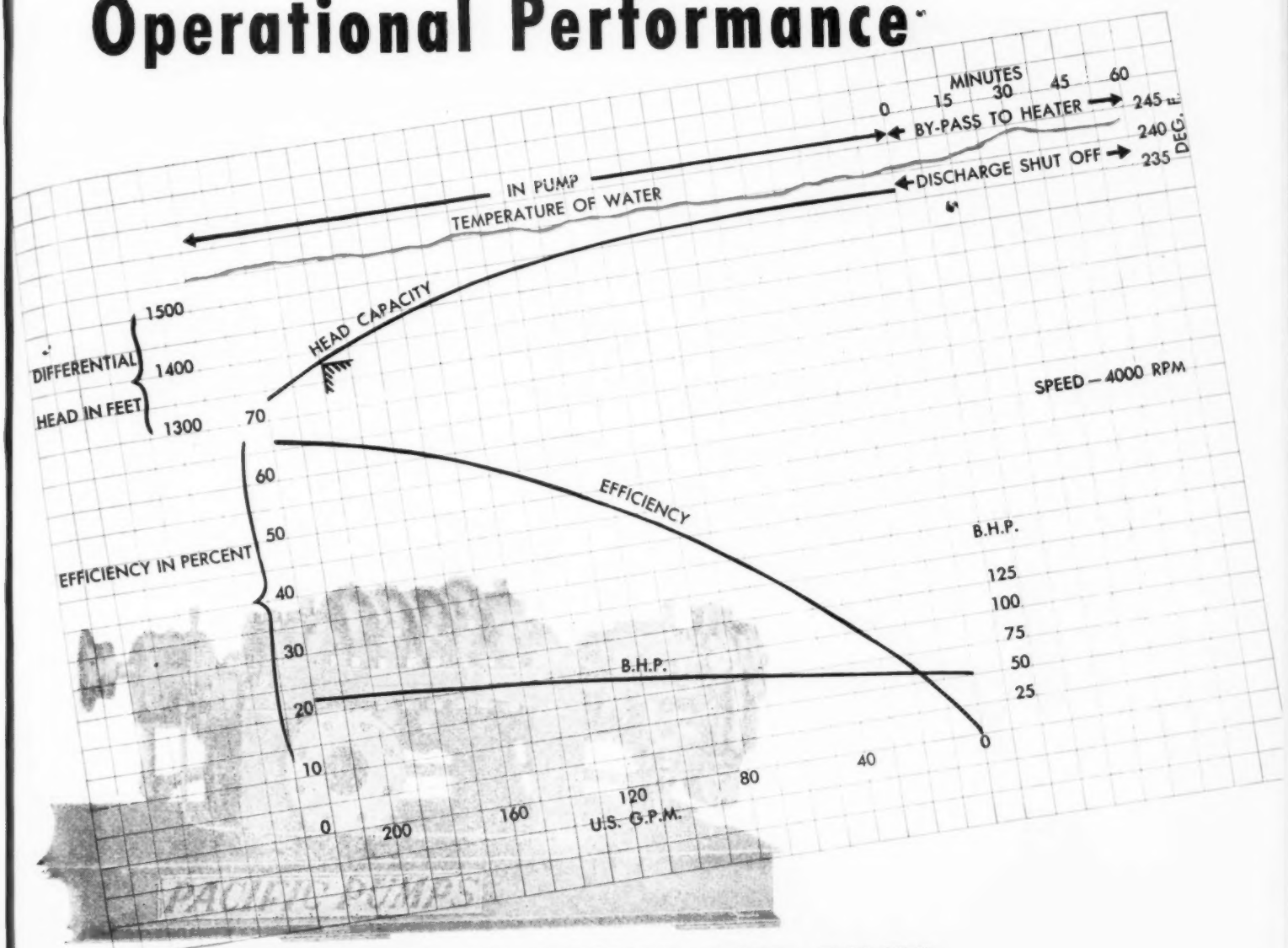
■ Every Mitco panel is a strong, integral unit, capable of supporting heavy loads without lateral deflection.

■ *Send details of area to be covered, giving size, type and location of supports, and Hendrick will submit Mitco recommendations—without obligation. Write for complete information.*

HENDRICK
Manufacturing Company
46 DUNDAFF STREET, CARBONDALE, PENNA.
Sales Offices In Principal Cities

Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
Amorgrids.

Operational Performance



PACIFIC MODEL JB BOILER FEED PUMP

SUSTAINED EFFICIENCY

because the short bearing span and the rigid shaft contribute to the maintenance of original clearances over long periods of continuous severe operation.

ECONOMICAL OPERATION

because engineered balance prevents undue vibration—impellers dynamically balanced—diffusers balance radial thrust —Pacific Stationary Floating Seal balances end thrust.

PACIFIC STATIONARY FLOATING SEAL

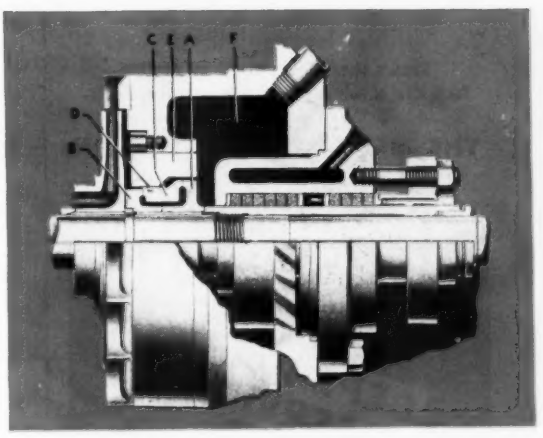
—makes positive automatic provision for by-pass return to feed water heater to prevent overheating of water when carrying light loads or operating with closed discharge —reduces high pressure back of last stage impeller to suction pressure in stationary floating seal chamber and maintains suction pressure on discharge end of stuffing box.

Write for Pacific Pumps Bulletin 80

PACIFIC PUMPS INC., *Huntington Park, California*

One of the Dresser Industries

Export Office: Channin Bldg., 122 E. 42nd St., N.Y.



(A) Low Pressure Seal Plate. (B) High Pressure Seal Plate. (C) Seal Bushing. (D) Piston Ring. (E) Seal Housing. (F) Chamber with By-pass Line.

PACIFIC *Engineered* PUMPS

Type DA-31 Pressure Control

MERCURY SWITCH
Hermetically sealed mercury switch is used. They cannot be affected by dust, dirt or corrosion; nor are they subject to open arcing, oxidation, pitting or sticking of contacts, all common causes of contact trouble. This switch will give better control service and longer control life.

BOURDON TUBE
(Hidden back of cover)
The Bourdon tube is the actuating element of the control. It is the oldest known, tried and proven element, having been used in gauges for many years.

OUTSIDE ADJUSTMENT
The outside double adjustment with the calibrated dial and pointers is a convenient feature, making it very easy to set the required operating range, plainly visible on the dial. All guesswork is eliminated.

GLASS FACE
The glass face on the cover permits seeing the entire operation of the control in plain view. One can always tell whether the switch circuit is open or closed, a great convenience whenever servicing becomes necessary.

Consult Mercoid on pressure, temperature, liquid level or automatic mechanical control problems.

THE MERCOID CORPORATION
4201 Belmont Avenue
Chicago 41, Illinois

THE ASSURANCE OF DEPENDABLE SERVICE BUILT IN EVERY MERCOID CONTROL

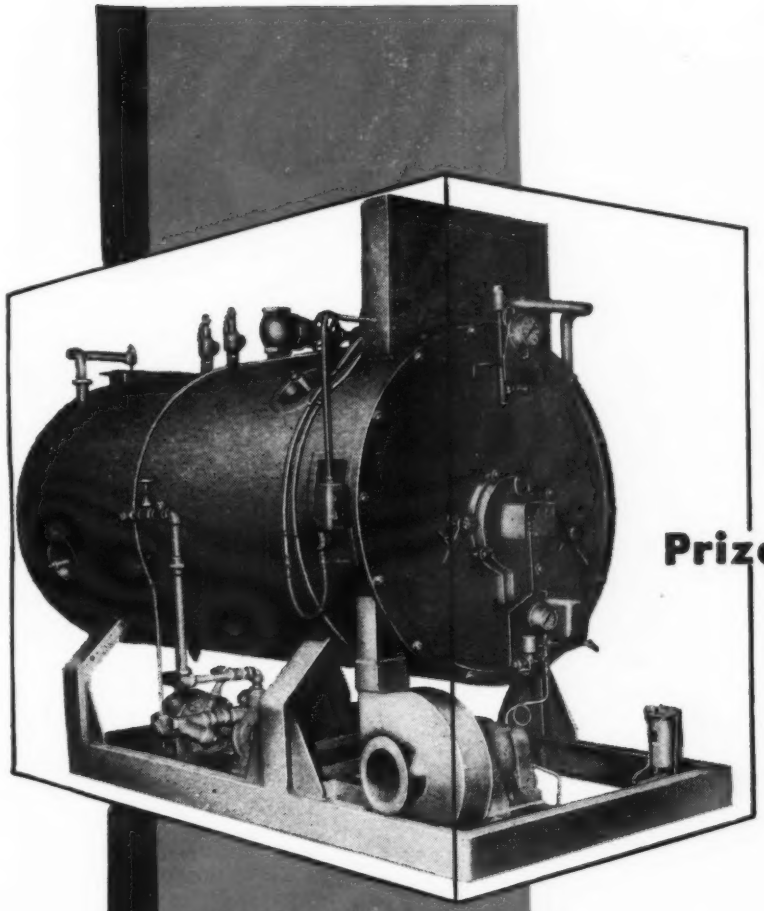
SPEEDING UP the assembly line

IN SPEEDING UP the fitting of machine parts by eliminating the precision machining otherwise required, Laminum shims actually add to the certainty of uniform accuracy . . . you simply peel laminations of known precision gauge from the solid shim. Bulletin on request.

Laminum shims are cut to your specifications. For maintenance work, however, shim materials are sold through industrial distributors.

Laminated Shim Company, Incorporated
61 Union Street • Glenbrook, Conn.

LAMINUM
THE SOLID SHIM THAT *peels* FOR ADJUSTMENT



Prize Package of Power!

AMESTEAM *Generator*

If ever there was a prize package of power, the AMESTEAM Generator is it! For it is a prize in every sense of the word.

It provides low-cost power, year after year...with minimum manpower and maximum efficiency. It can be installed in a matter of minutes...can be repaired (when necessary) in very short time . . . and because it is automatic in operation, it is easy to handle.

Designed for the small and medium-sized plant, and manufactured with the skill that 100 years of experience have developed, the AMESTEAM Generator will live up to all your expectations. Write or phone for full details today—if you need a power unit in ranges from 10 to 300 horsepower.

A complete Return to the Boiler System, including Feed Water Pump and Condensate Tank with their accessories, is part of the standard equipment with every standard AMESTEAM Generator.

AMES IRON WORKS

BOX B-6 OSWEGO, NEW YORK

HERCULES
SEAMLESS COPPER
FLOATS

GUARANTEED

TO STAND UP!

Every Hercules Float carries our guarantee to stand up under 350 lbs. working pressure and 500 degrees temperature.

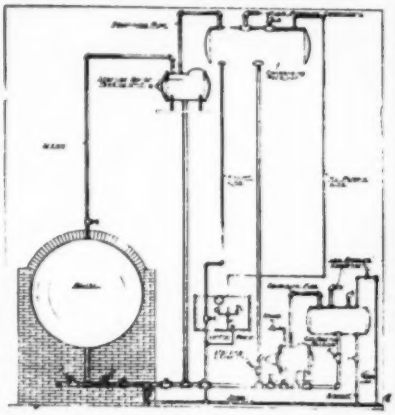
Fabricated of seamless copper under our special spinning process. Hercules Floats are uniform in thickness and high in mechanical strength.

You can depend on Hercules for floats—in standard shapes up to 10 in. and in special types to your specifications—to give long, dependable, economical service. Insure carefree maintenance of water level in your heaters, tanks, reservoirs and other equipment by specifying "HERCULES."

HERCULES FLOAT WORKS
200 Franklin St.
SPRINGFIELD, MASS.

Sterling

Lifting — Pumping — Boiler Feeding — Vacuum Creating and Vacuum Draining Units



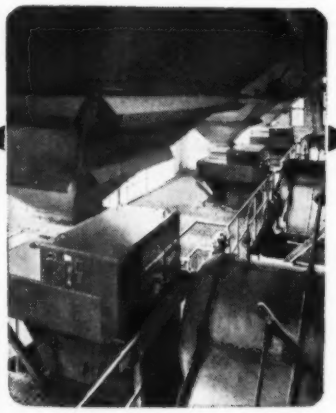
The Exclusive Sterling Closed Condensate Return System saves you FUEL . . .

It retains the condensate temperature, sending it back to the boiler room under pressure without venting to the atmosphere. Only a nominal line drop in temperature giving maximum efficiency, economy and reducing boiler maintenance.

Sterling Engineering & Mfg. Corp.
(TEMPLETON MANUFACTURING CO.)
110 Business St. Hyde Park 36, Mass.

DETERMINE [BOILER EFFICIENCY EVERY DAY—FOR EACH BOILER

WEIGH *all coal accurately on Richardson Automatic Coal Scales*



View showing top of boilers and storage hoppers with Richardson Automatic Coal Scales at bases. Weighing is automatic with visual indication of accuracy. Coal is then fed directly to stoker hoppers.

For maximum economy in boiler operation it is essential that operators check boiler efficiency often. Daily determinations provide an effective indication of boiler operating conditions at all times.

Richardson Automatic Coal Scales provide an accurate and continuous means of determining exact steam generation per pound of coal *by each boiler.* Leading firms report big operating economies when boilers are kept *constantly on test* the Richardson way!

Don't guess at your boiler efficiency—determine it by weight. Write for Bulletin No. 1143. 905

RICHARDSON SCALE COMPANY, Clifton, N. J.
ATLANTA · BOSTON · BUFFALO · CHICAGO · MINNEAPOLIS · WICHITA
NEW YORK · OMAHA · PHILADELPHIA · SAN FRANCISCO · DETROIT · PITTSBURGH · MONTREAL · TORONTO

solved by Oakite

A Fast Way to Strip Paint from Transformers

Next time you paint-strip transformers, use the Oakite Hot Flow-On Method to obtain these five time- and money-saving features! Your nearby Oakite Technical Service Representative will give you tank-installation details and solution-temperature specifications.

1. COMPLETE REMOVAL down to the bare metal of any number of previous coats—10 or 20—by means of powerful Oakite STRIPPER in the solution.
2. TRIPLES SPEED of ordinary paint-stripping methods . . . result of unique "flow-on" technique applied through shower-type nozzles.
3. EFFECTIVE ACTION against every type of finish, including synthetic enamels.
4. MAXIMUM ECONOMY . . . fast, thorough stripping readies surfaces for simple priming and repainting.
5. LONG SOLUTION LIFE . . . technique assures return of solution for repeated pumping and continued re-use.

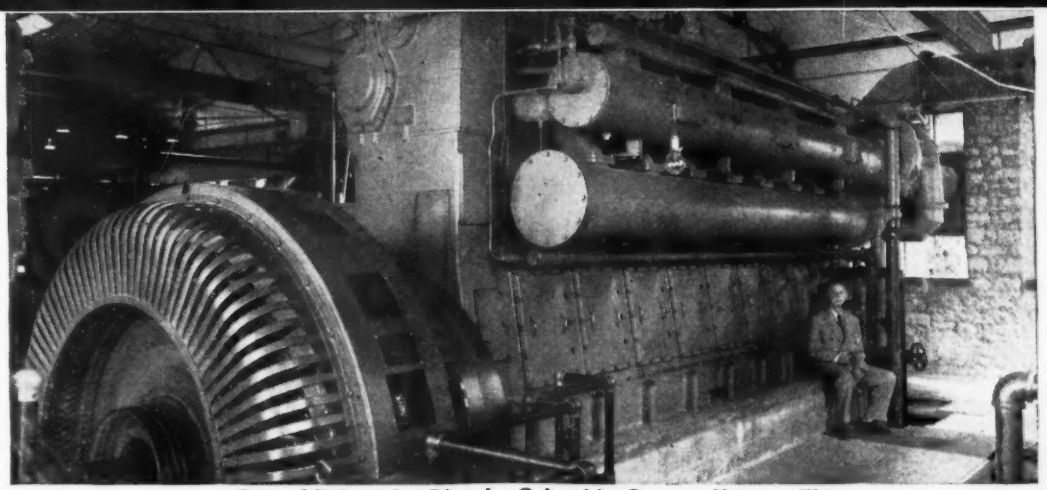
If your shop does not have facilities for heating solution, ask our Representative for details of the Oakite Cold-Spray Technique. 20-page Digest gives complete instructions. Write on letterhead for it TODAY!

OAKITE PRODUCTS, INC.
23 Thames Street, New York 6, N. Y.
Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE *Specialized* **CLEANING**
MATERIALS • METHODS • SERVICE

Superior DIESELS

. . . . will give you consistent power profit



One of 7 Superior Diesels, Columbia Quarry, Krause, Ill.

with a minimum of upkeep

Superior ENGINES

SUPERIOR DIESELS • MARINE • STATIONARY • LOCOMOTIVE

Division of THE NATIONAL SUPPLY CO., Plant and General Sales Office: Springfield, Ohio

...don't let moisture soak up your profits

Unnecessary motor maintenance expense and reduced production efficiency *soak up profits*.

One easily avoidable loss—motor failures caused by excessive moisture—is being minimized by using Fiberglas* High-Safety-Factor Electrical Insulation. Properly impregnated, Fiberglas resists the effects of moisture and also provides "extra protection" against the other principal causes of motor failure, such as overloads, heat, oil and corrosive vapors.

For example, a midwestern concern uses a ¼ hp., 440-volt, 3-phase, 1750 rpm motor to drive agitator paddles in an annealing tank. Moisture and high heat caused failure of the organic insulation and burnouts occurred approximately every six months. The motor was rewound with Fiberglas Electrical Insulation and has been in operation for over three years, on a 24-hour, 7-day a week schedule.

Put profits back—where they belong. Investigate the *use economies* of Fiberglas Electrical Insulation in *your* motors.

For additional information, consult your Fiberglas Distributor. Descriptive catalog data may be obtained by writing Owens-Corning Fiberglas Corporation, 2000 Nicholas Bldg., Toledo 1, Ohio.

In Canada, Fiberglas, Ltd.
Oshawa, Ont.

FIBERGLAS

*T. M. Reg. U. S. Pat. Off.

Electrical Insulation Materials

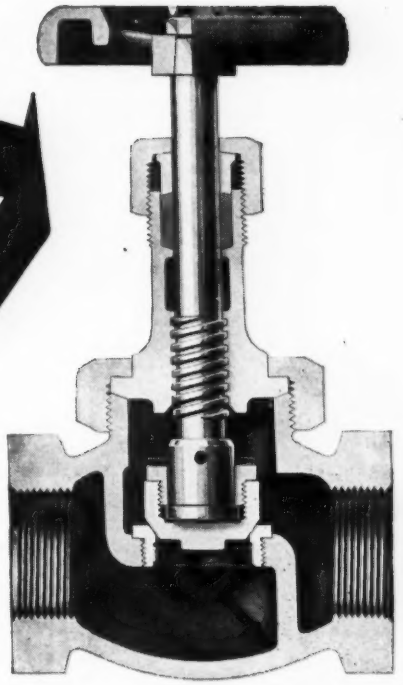
OTHER FIBERGLAS PRODUCTS: THERMAL INSULATION MATERIALS • DUST-STOP* AIR FILTERS • FIBERGLAS YARNS AND CLOTHS • FIBROUS GLASS MATS

Every feature you want in a

BRONZE GLOBE VALVE

with Full-way Disc...

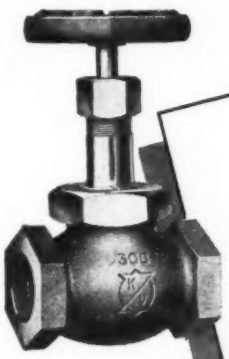
is in this KENNEDY DESIGN



You can use this Kennedy design on high temperature steam, water, oil or gas lines with full confidence that it will give complete satisfaction.

Notice the sturdy construction of every part . . . the renewable disc and seat ring . . . the full-way disc area . . . the ample pipe-end clearances and packing space . . . the true union joint made by the body-bonnet connection . . . and the many other details that provide *what you want* in a full-way disc globe or angle valve.

These valves are furnished in a full range of sizes for 200-lb. and 300-lb. steam pressure at 550° F. and for cold water, oil or gas pressures up to 600-lb. Complete description, specifications, dimensions and prices are given in the 240-page Kennedy Catalog which will be sent on request.



YOU WANT THESE VALVE FEATURES
. . . you'll find them in this KENNEDY design

1. **Generous Strength . . .** Body and bonnet are of high-grade dense metal with ample thickness and rounded fillets. Stem has large diameter and extra large number of contact threads.
2. **Easy Operation . . .** Stem and stem contact surfaces are accurately threaded. Deep stuffing boxes permit tightness without undue pressure on packing. Large handwheel gives firm, comfortable grip.
3. **Lasting Tightness . . .** Discs and seats seat accurately, and their sturdy design resists distortion and has special provisions for take-up of wear.
4. **Long Life . . .** Many Kennedy valves have been in daily use a quarter century and more.
5. **Convenient Repacking . . .** Glands and packing are easily accessible.
6. **Economical Maintenance . . .** Long wear built into all parts, and adjustments or other attention are seldom required.

THE KENNEDY VALVE MFG. CO.
Elmira, New York

KV-114

KENNEDY *valves - pipe fittings - fire hydrants*

FABER FUEL OIL BURNING EQUIPMENT

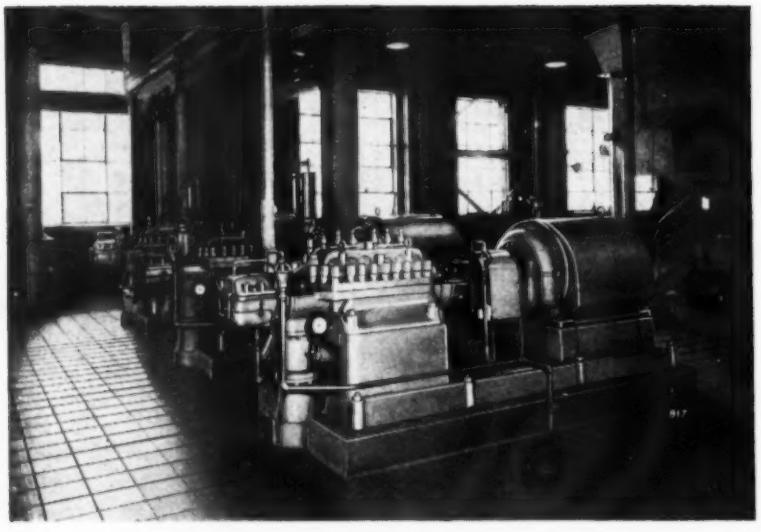
PERFORMANCE — PROVED

Increased Capacity, Higher Efficiency, Wider Range of Operation, Lower Power Cost With FABER AUTOMATIC CONTROLLED BURNERS

FABER ENGINEERING COMPANY

PHILADELPHIA 34, PA.

THRUST-TROUBLE FREE PERFORMANCE



In Pennsylvania *Thrustfre* multi-stage centrifugal pumps dynamic hydraulic balance is effected without the aid of internal or external mechanisms. Result, thrust-trouble-free performance and elimination of thrust control devices with their attendant worries.

Descriptive Bulletin 238 on request

PPC

PENNSYLVANIA PUMP & COMPRESSOR CO.

BUSHKILL PARK ROAD, EASTON, PENNA.

Flight-tested to 100 Degrees Below Zero with

TRADE MARK FRICK

Refrigeration

Reports on the temperature, humidity, and pressure of the air are radioed back to recording instruments on the earth by the Bendix-Friez Radiosonde, carried to heights of 16 miles or more by a balloon. These "weather" reports proved invaluable to the United Nations during the War: thousands of Radiosondes were sent aloft each month.

The Friez Instrument Division of Bendix Aviation Corp. calibrates Radiosondes in its plant at Towson, Md., with the test chamber shown below. This is cooled from +104 to −100 deg. F. in 75 minutes, the air pressure being simultaneously reduced to match flight conditions. Cooling is accurately controlled by a two-stage Frick refrigerating system using Freon-22.

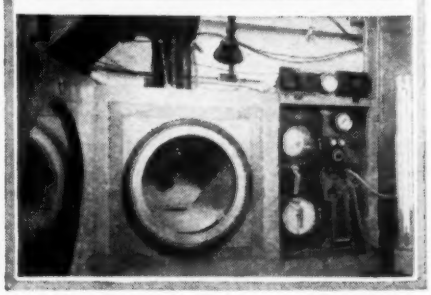
The installation was designed and erected by the Paul J. Vincent Co., Frick Distributors at Baltimore.

For the solution of that particular refrigerating, ice-making, or air conditioning problem of yours, get in touch with the nearest Frick Branch or Distributor.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

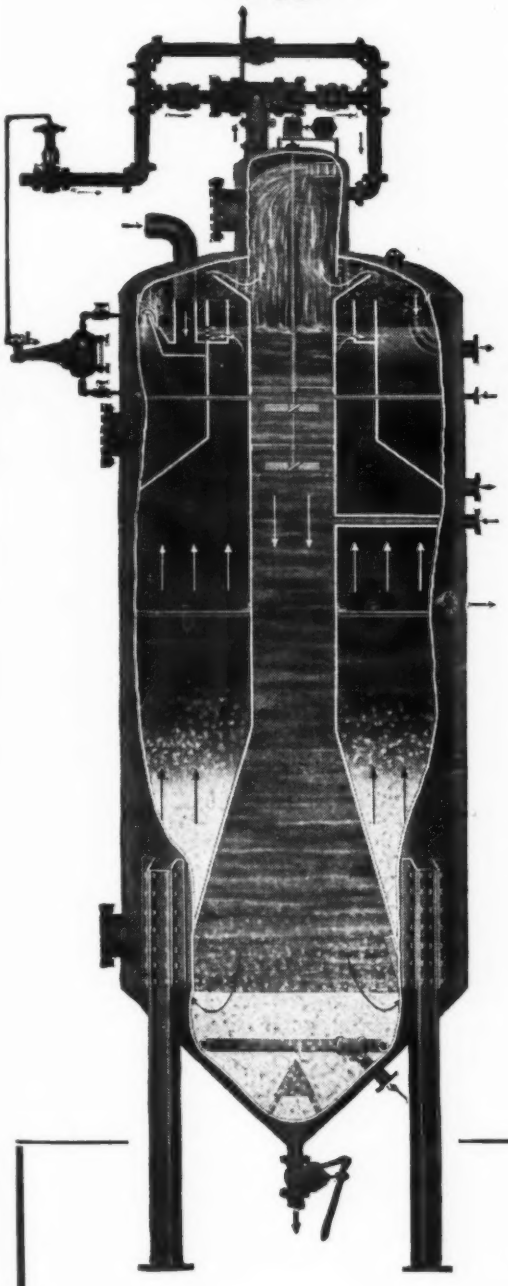


WATER CONDITIONING *Facts* WORTH KNOWING

No. 5 in a series

SILICA REMOVAL IS

A CHEMICAL AND MECHANICAL PROBLEM



Cross-section view of the Graver Hot Process Water Softener showing how sludge recirculation and sludge contact is provided for in the sedimentation tank.

For continuous trouble-free boiler operation, a completely softened water is required. Silica, if present, must be removed from the water to prevent the formation of hard flint-like silica scale in boilers. Numerous chemicals are available which form precipitates in the water to remove silica during the softening process, but silica removal is only partially a chemical problem. Mechanical design of the Silica Removal equipment is also highly essential.

A most important step in silica removal is sludge recirculation and the mixing of such sludge with the heated incoming water. In addition, contact of the water being treated with the sludge in the sedimentation tank should be intimate and sustained, which at controlled velocities provides a finished water with a lower silica content than that obtained from ordinary settling tanks.

GRAVER HOT PROCESS SOFTENER SEDIMENTATION TANK—DESIGNED FOR SILICA REMOVAL

This equipment provides all the necessary features for the optimum removal of silica from boiler feed water. Recirculated sludge is thoroughly mixed with incoming water in a confined chamber. The Graver flared downcomer (see cut-away view) provides for the intimate contact with the sludge at the bottom of the tank at velocities which will not cause carry-over of formed sludge.

Graver Chemical Mixing and Proportioning equipment provides accurate means for the feeding of the necessary chemicals for both the reduction of silica and the softening process.

Graver's ability to design, build and install water treating equipment of all types is backed by more than 35 years of experience in the field. Why not take advantage of this proven ability the next time a water conditioning problem confronts you? It's Graver's pleasure to solve tough problems. Write, wire or phone for immediate attention.

Process Equipment Division of

GRAVER TANK & MFG. CO., INC.

General Offices: 4809-25 Tod Ave., East Chicago, Indiana

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Export Dept.: 424 Madison Ave. New York, N. Y.

GRAVER WATER CONDITIONING EQUIPMENT

Hot Process Water Softener • Zeolite Water Softeners • Water Filters • Taste and Odor Removal Filters • Iron Removal Filters • Oil Removal Filters • Chemical Mixing and Proportioning Equipment • Demineralizers

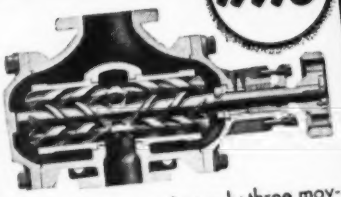
Make Your Overhead Valves SAFE and Easy to Reach---

With the Babbitt Rim for Valves you eliminate danger and banish the step ladder. You can now place your valves wherever they come economically and conveniently. They fit any valve. Let us tell you more about them. Write today.

BABBITT STEAM SPECIALTY CO.
New Bedford, Mass.

THE *PUMP* WITHOUT PISTONS, VALVES, BEARINGS, GEARS OR VANES

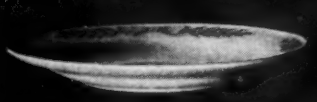
IMO



The IMO pump has only three moving parts—a power rotor and two sealing rotors — nothing to get out of order or to require adjustment. The IMO pump can be depended upon in hydraulic service, governor service, lubrication service and other applications in which continuity of operation and freedom from maintenance are vital.

For further information send for catalog I-131-P

IMO PUMP DIVISION of the
DE LAVAL STEAM TURBINE CO.
TRENTON 2, NEW JERSEY



a saucer from the five and dime

a few drops of Phenolphthalein from a drug store

a few drops of Methyl Orange from a drug store

a few ounces of NCC (which we will furnish FREE)

and you can test for yourself that

NCC

SLUDGE SOLVENT
AND FUEL OIL CONDITIONER

1. Dissolves even the hardest sludge

2. Contains no caustic

3. Is acid-free

HOW TO MAKE THE TESTS

FOR SLUDGE

Place some sludge in a saucer (a scraping from the fill pipe is an easy way to get some). Add enough NCC to cover completely. Right before your eyes you will see the sludge dissolve.

FOR ACID

The accepted test for acid in a liquid is the addition of Methyl Orange which turns the tested liquid pink if it contains acid; yellow, if acid-free. NCC turns yellow, proving that it is neutral and acid-free.

FOR CAUSTIC

The accepted test for caustic in a liquid is the addition of Phenolphthalein which turns the tested liquid pink if it contains caustic. Into a saucer pour some NCC. Add a few drops of Phenolphthalein. NCC will remain water-white, proving that it contains no caustic.

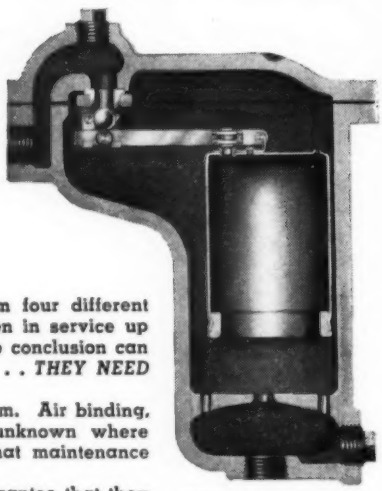
A sample of NCC, to enable you to make these tests, will be sent postage-paid and FREE. Please write on your company letterhead.

NUTMEG CHEMICAL CO.
233 State St., New Haven, 10, Conn.

ATTENTION *is something CRYERS DONT NEED*

...all's well with CRYER TRAPS

— no Cryer Trap cleaned in 5 years
— no replacements in three years
— cleaned only once a year
— need very little care



Sizes: ½" to 2½"; capacities, 500 to 30,000 lbs. of water; pressures, 0 to 250#.

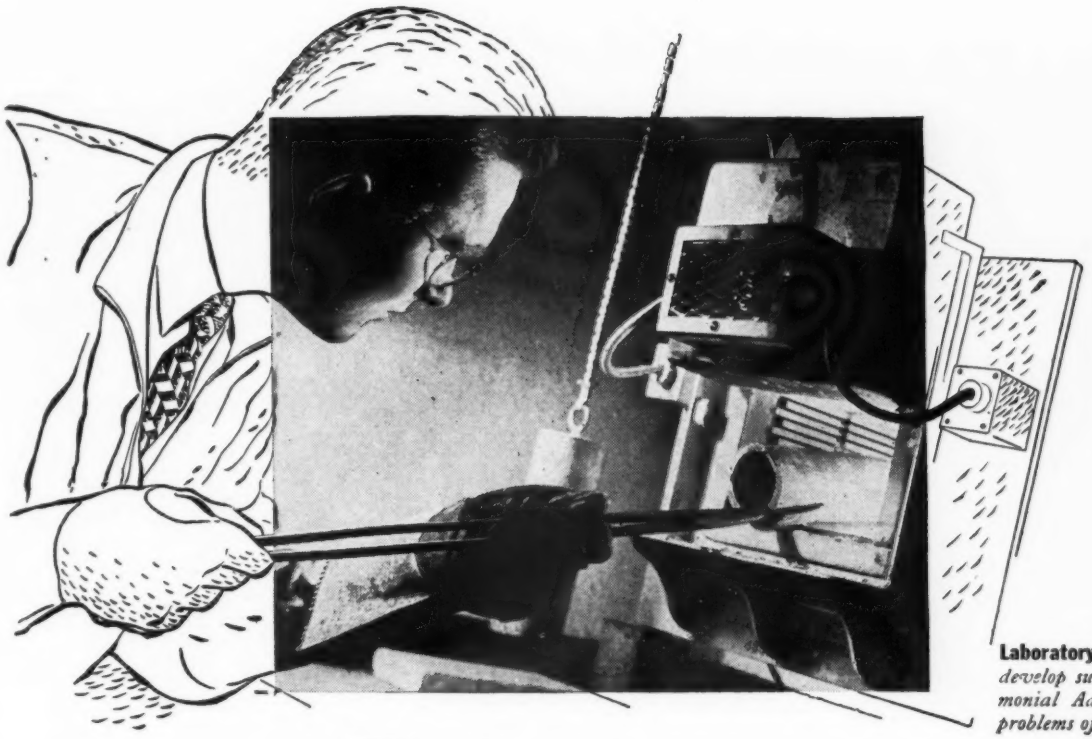
The above are abstracts from reports from four different plants where Cryer Steam Traps have been in service up to ten years. From these remarks, only one conclusion can be drawn with regard to CRYER service . . . *THEY NEED VERY LITTLE ATTENTION.*

To install Cryers is to be able to forget them. Air binding, slow venting and dribbling are almost unknown where Cryers are on the job and that means that maintenance costs are practically nil.

Cryer Traps are sold on a money back guarantee that they will operate satisfactorily at rated capacities within pressure limits. Thats your assurance of attention-free performance. It will pay you to prove it for yourself. Further details on request.

We carry all sizes of traps and repair parts for the line formerly known as the J-M Ball Steam Trap.

CRYER TRAP & VALVE CO., INC.
Manufacturers of Steam Specialties for over 40 years.
366 MADISON AVE. NEW YORK 17, N. Y.



Laboratory test furnaces *help Chase develop such special alloys as Antimonial Admiralty to meet corrosion problems of the power industry.*

More Resistant to Dezincification

CHASE ANTIMONIAL ADMIRALTY*

cuts annual condenser tube replacement costs!

YOU can reduce your tube replacement costs considerably with condenser tubes made of Chase Antimonial Admiralty. The reason: Admiralty with the addition of Antimony offers much greater resistance to dezincification.

To power engineers this means considerably longer condenser tube life, fewer tube replacements, and more efficient operation. Yet you pay no more for Antimonial Admiralty than for plain Admiralty tubes.

Find out more about this patented Chase copper alloy . . . about its longer service life and tube replacement economy. For full details, phone your nearest Chase Warehouse or Service Office.

*U. S. Pat. No. 2,061,931

CHASE

Special Stocks of ANTIMONIAL ADMIRALTY Condenser Tubes in Chase Warehouses at LOS ANGELES NEW ORLEANS SAN FRANCISCO

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ALBANY† ATLANTA† BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO.† LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WASHINGTON†

† *Indicates Sales Office Only*

This is the Chase Network—handiest way to buy brass

Gives You

LONG, TROUBLE FREE SERVICE!

Fig. 1635

"STANDCO"

PILLOW BLOCKS

The attractive "Standco" Pillow Block shown above is sturdily built and is offered in a wide range of sizes. Babbitted and broached bearing surfaces, accurately machined faces. Can be amply lubricated.

Write for Bulletin

"Unbrako" and "Hallowell" products are sold entirely through distributors.

Over 43 Years In Business

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 577

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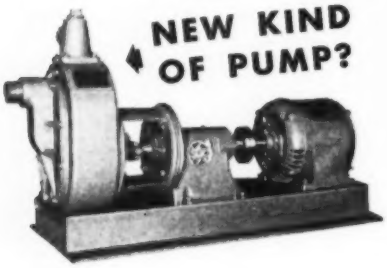
Have you started to use this

NEW KIND OF PUMP?



SELF-PRIMING, even on high suction lifts. Has no auxiliary priming devices. Gravity flow to the pump is not required. Reliable for continuous or intermittent service.

- Combines centrifugal efficiency with automatic action.
- Impeller alone moves the liquid.
- No parts which require adjustment or manipulation.
- Will handle wide variety of liquids: clear, gritty, volatile.
- 1½ to 10-inch sizes. 50 to 4000 GPM.

MARLOW PUMPS

RIDGEWOOD 10, NEW JERSEY

Manufacturers of the World's Largest Line of Self-Priming Centrifugal Pumps

for plants that . . . . . .

PROCESS LIQUIDS

. . . . . IT PAYS TO STANDARDIZE ON

BOWSER ESTABLISHED 1885

METERS • FILTERS
PROPORTIONERS
VACUUM STILLS
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PUMPS

Because

THERE IS NO SUBSTITUTE FOR 60 YEARS OF BOWSER EXPERIENCE

. . . designing and building equipment for measuring, handling, processing and storing HUNDREDS OF DIFFERENT LIQUIDS. Every Bowser product is designed to improve some industrial process.

PLANT EXPERIENCE PROVES

. . . that interchangeable parts, similar maintenance methods and a single source for all equipment lowers operating costs in any plant. This advantage is enjoyed today in hundreds of Bowser-equipped plants. Liquids vary from naphtha to tar.

An engineer from a Bowser office near you will gladly check your plant and make recommendations. No obligation except to serve you promptly. Please write us indicating liquids, temperatures and volume.

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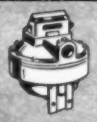
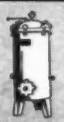
1335 Creighton Avenue — Fort Wayne 2, Indiana

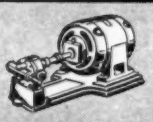
LIQUID CONTROL SPECIALISTS SINCE 1885



METERS



FILTERS



PUMPS

PACKAGING UNITS

BLACK MAGIC

PIPE SEALING COMPOUND

CHAMPION

A FAMOUS NAME IN PAPER

ADDS ANOTHER WATER-CONDITIONING UNIT OF A SIMILARLY WELL-KNOWN NAME . . . . .

. . . and hundreds of other Cochrane Deaerators and Hot Process Water Softeners are used by the Pulp and Paper Industry.

Recently installed at the Canton, N. C. plant of Champion Paper & Fibre Company is the Cochrane Deaerator, of 400,000 lbs. per hour capacity, shown above. This unit, mounted on a storage tank, works in parallel with a 600,000 lbs /hr. Cochrane Deaerator installed 15 years ago. Other Cochrane water-conditioning units in Champion plants include a 225,000 lbs./hr. Deaerator at Houston, Texas, and a 24,000 GPH Hot Process Softener at Hamilton, O.

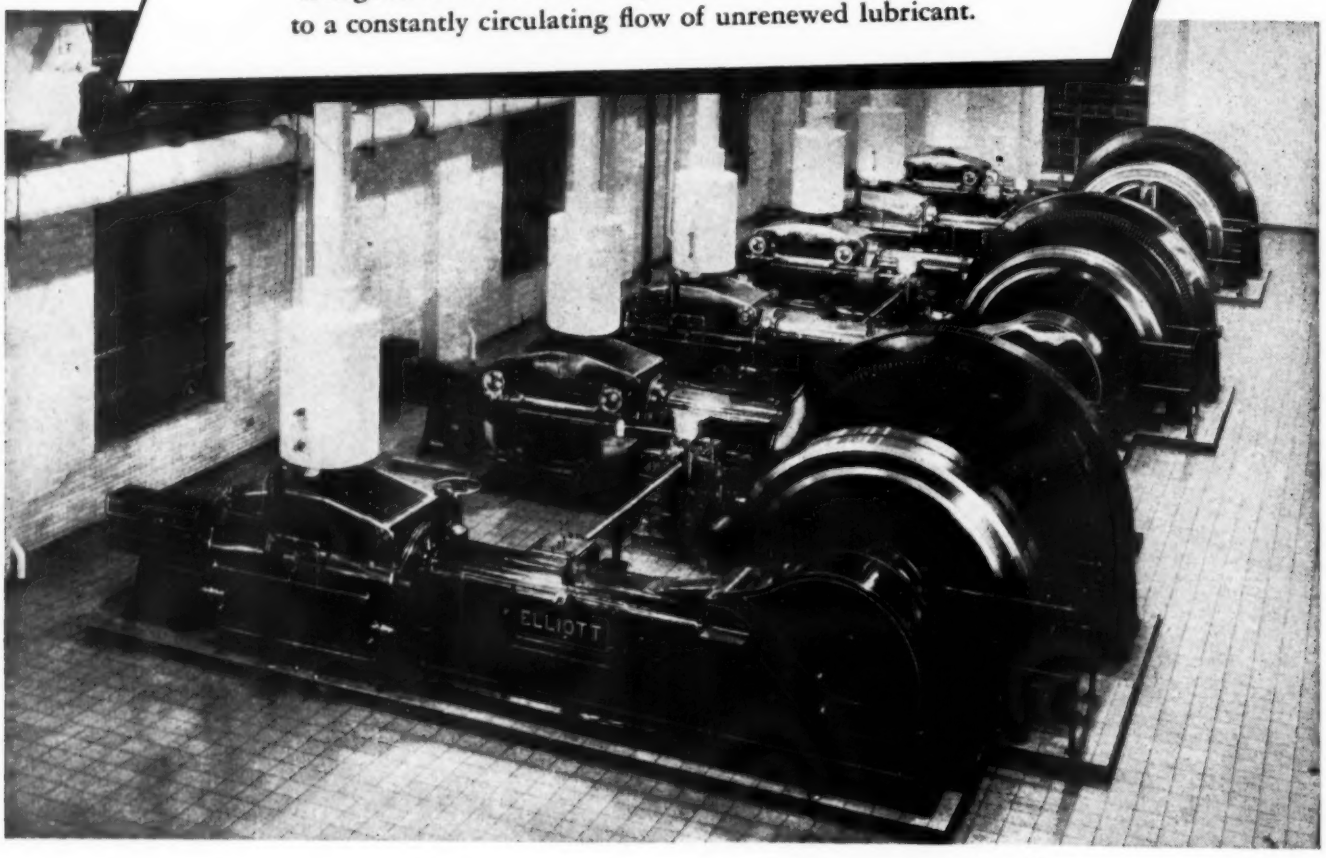
COCHRANE

COCHRANE CORPORATION, 17th & Allegheny Ave., PHILADELPHIA 32, PA.

PRECISION REFINED FOR PRECISION EQUIPMENT

SINTURLITE

Designed for service where precision parts are subjected to a constantly circulating flow of unrenewed lubricant.



OXIDATION — always a possibility in lubricants which are constantly re-circulated through high speed mechanism — causes gum and sludge which limits oil life and contributes to inefficiency and equipment failure. The proper lubricant is made to withstand oxidation and resist possible breakdown.

SINTURLITE is precision refined to meet requirements of precision equipment. Extra quality is built in by modern refining methods and special care. Additives give further protection against oxidation.

Non-corrosive and non-foaming, SINTURLITE separates readily from water. For long, uninterrupted service without deterioration, use *precision-refined* SINTURLITE.

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVE., NEW YORK 20

THEY READ AN *Advertisement*

AND SAVED $89,000 THE NEXT YEAR IN POWER COSTS

THIS is exactly what happened in the case of a nationally-known hotel and office building. Eighty-nine thousand dollars isn't exceptional—it's a typical instance of the annual savings realized by hundreds of purchasers of Skinner "Universal Unaflow" steam engines, under our Guaranteed Saving Contract. These customers include almost every type of American industry and institution.

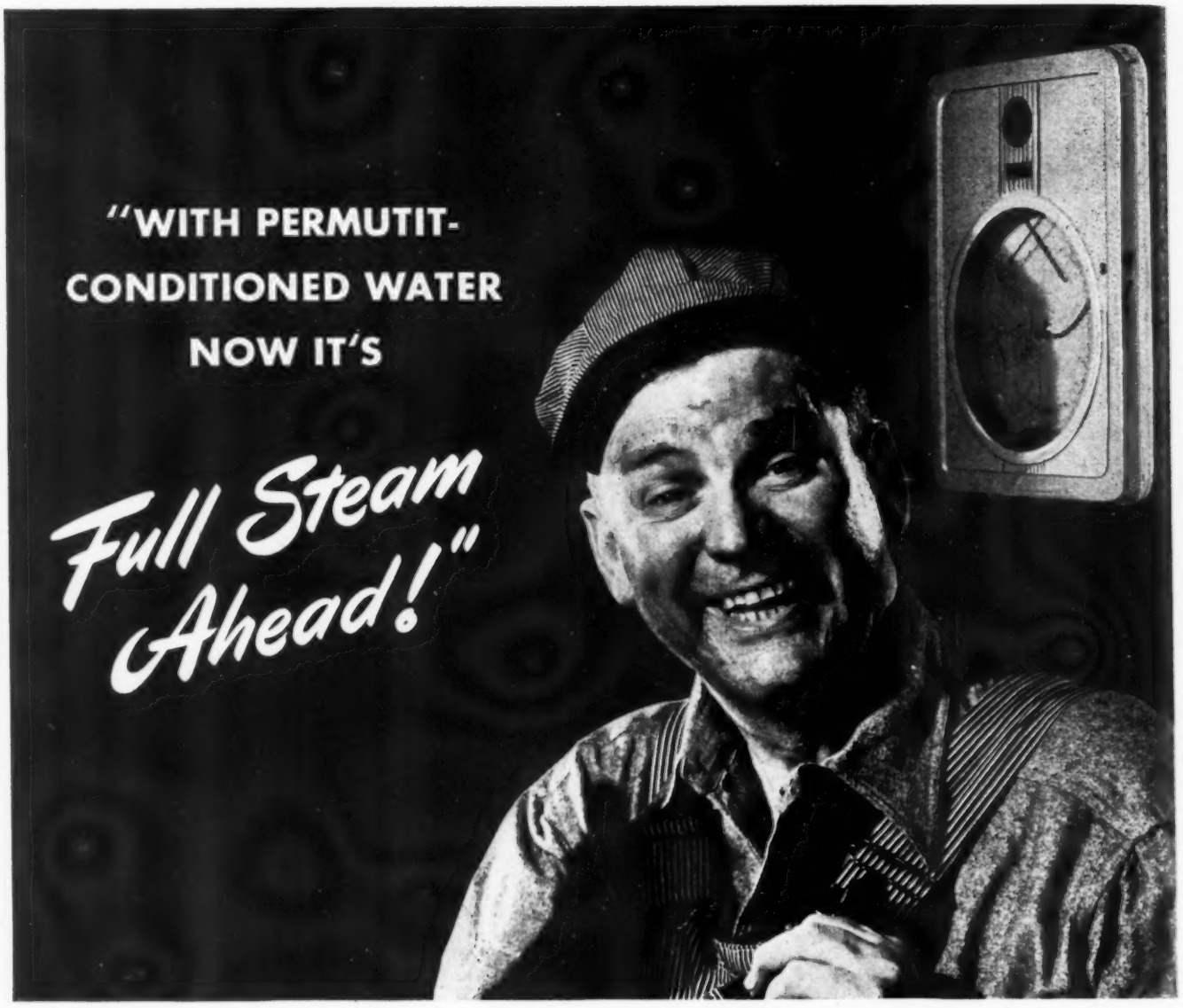
Such sales have totalled well over $5,000,000, against which the payments in cash have totalled only slightly over $1,000,000. In more than one-third of the cases, the cash payment was exactly $1.00. Not only do we guarantee to save you money; we guarantee that such savings will retire the deferred amount of the contract cost of the "Universal Unaflow" installation within a definite period of time, and *we make that guarantee with our own money.*

Our engineers, without expense or obligation on your part, will analyze your needs for electric power and for low-pressure steam, and will present their estimate of your monthly savings which will liquidate the investment. Compare this with your present power costs. Remember, that without making a large cash outlay you are acquiring a valuable capital asset.

Let us send you actual case studies of what other users, with similar problems, have saved by calling in our engineers.

For Over 75 Years, Doing One Thing Well—Building Steam Engines

SKINNER ENGINE COMPANY, ERIE, PA.



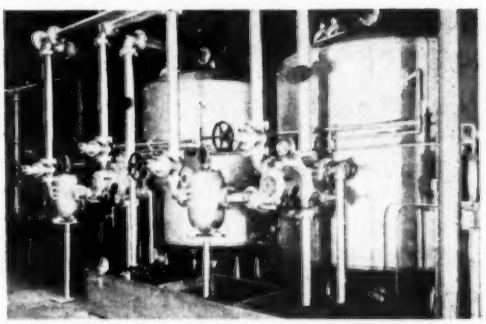
How Permutit protects boilers against scale and corrosion . . .

There's no boiler scale or corrosion to slow down production in the plant that's Permutit* protected. Permutit Water Conditioning removes the impurities in boiler feedwater *before it enters the boilers.*

Among Permutit processes for control of water quality, power plants favor particularly the Zeo Karb* Water Softener (right), Hot and Cold Lime Soda Softeners, Deaerating Heaters, Continuous Blowoff and Demineralizers that deliver a low-cost substitute for evaporated water.

Why risk damage to critical equipment and even possible shutdowns? Make it "full steam ahead" instead, with Permutit-Conditioned water. Write us about your water problem. Address The Permutit Co., Dept. P6 330 West 42nd Street, New York 18, N. Y. or Permutit Co. of Canada, Ltd., Montreal.

*Trademarks Reg. U. S. Pat. Off.



PERMUTIT ZEO-KARB* H WATER CONDITIONER removes both hardness and bicarbonates from water. Effluent contains no incrustants, is reduced in total solids and alkalinity. Alkalinity can be adjusted by mixing effluents from a Zeo-Karb H unit and a sodium zeolite unit.

*Trademarks Reg. U. S. Pat. Off.

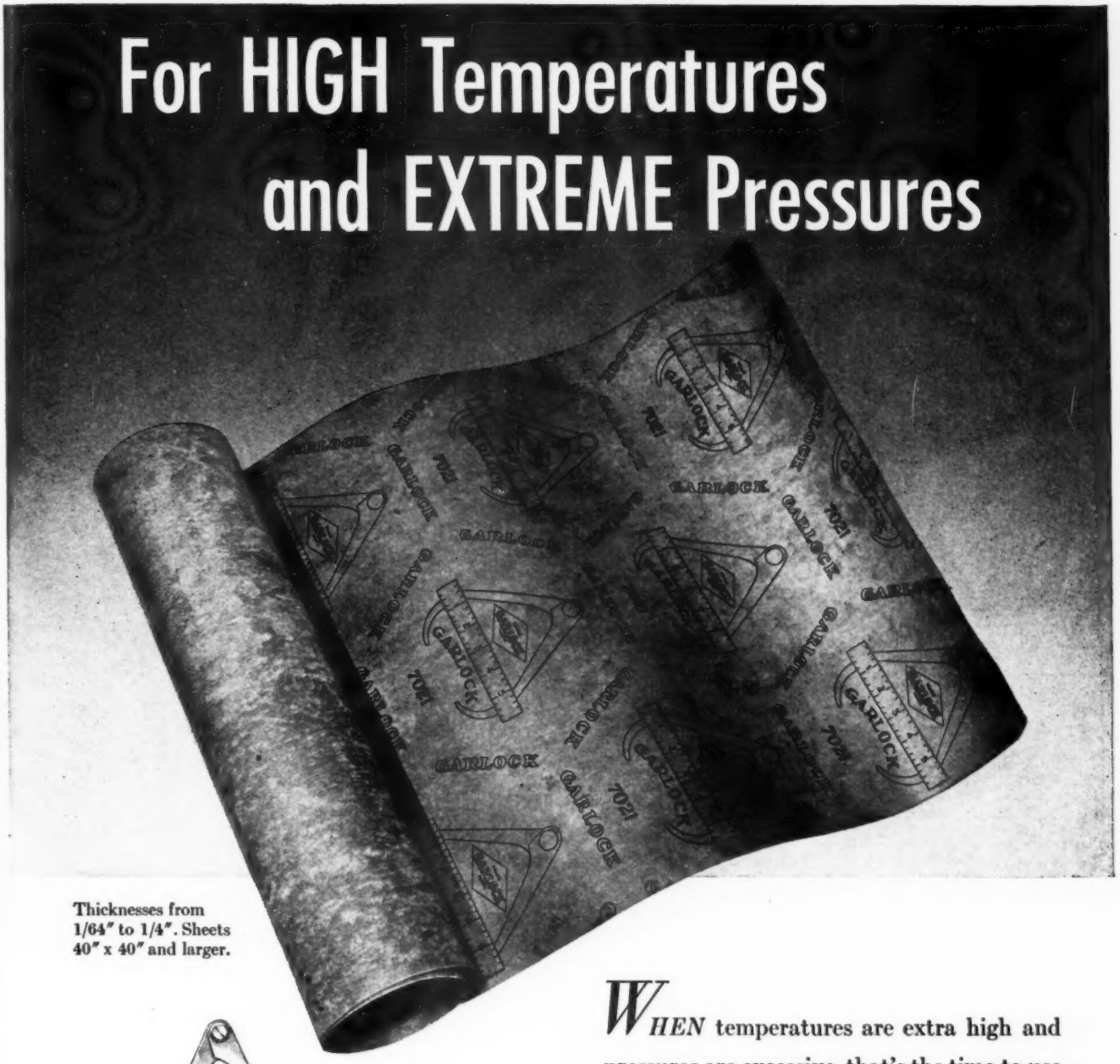
PERMUTIT

Manufacturers of ALL types of water treatment equipment

It's good business to begin with Good Water

WATER CONDITIONING HEADQUARTERS

For HIGH Temperatures and EXTREME Pressures



Thicknesses from 1/64″ to 1/4″. Sheets 40″ x 40″ and larger.

THE GARLOCK PACKING COMPANY
PALMYRA NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

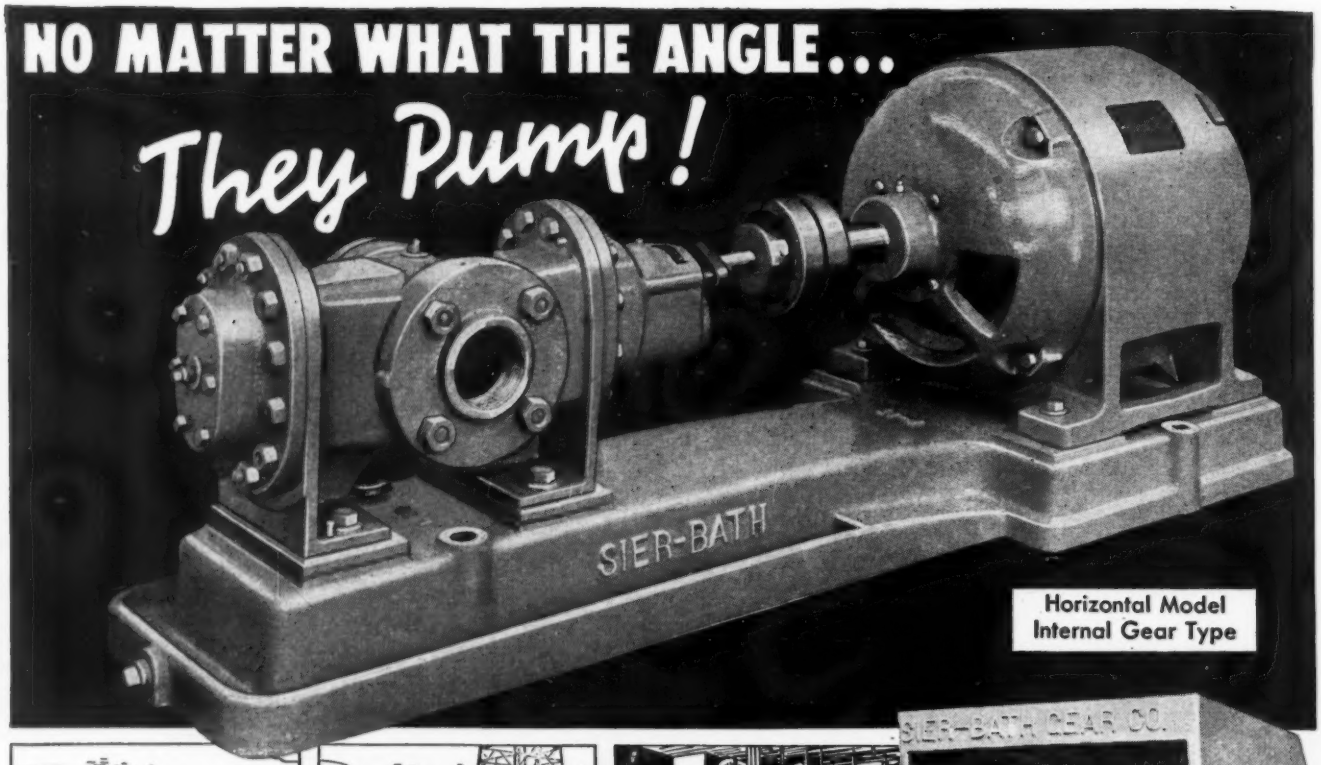
WHEN temperatures are extra high and pressures are excessive, that's the time to use GARLOCK 7021 Compressed Asbestos Sheet Packing. Gaskets cut from 7021 give superior service on pipe lines and other equipment handling gasoline, oil, gas or steam at high temperatures and extreme pressures. Tough, yet resilient, GARLOCK 7021 is economical and efficient under severe conditions.

GARLOCK 7021

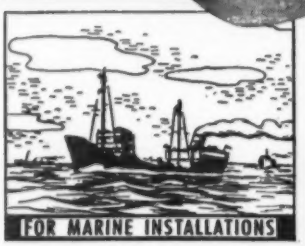
COMPRESSED ASBESTOS SHEET PACKING

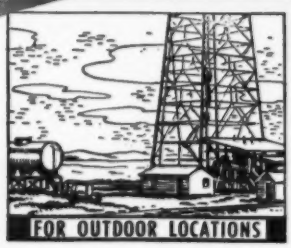
NO MATTER WHAT THE ANGLE...

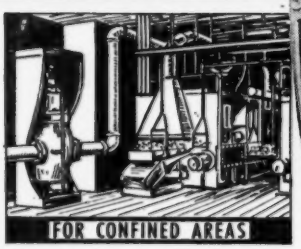
They Pump!

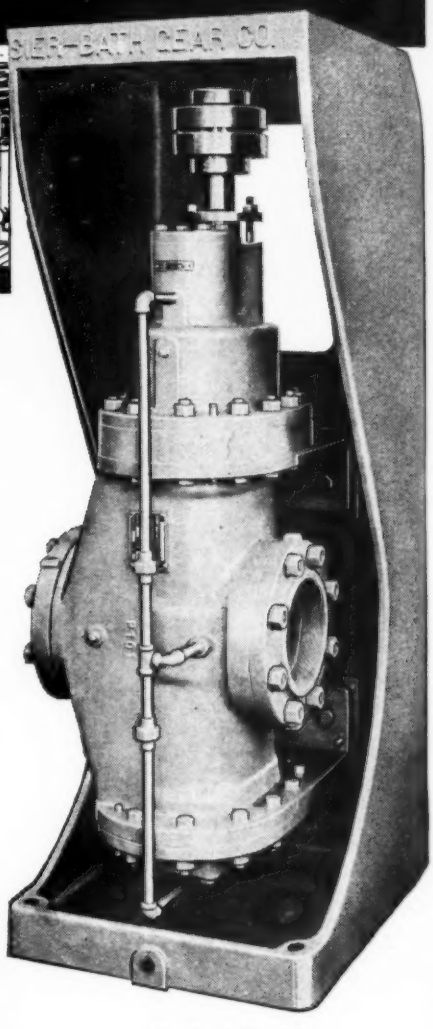


Horizontal Model
Internal Gear Type


FOR MARINE INSTALLATIONS


FOR OUTDOOR LOCATIONS


FOR CONFINED AREAS



Vertical Model
This unit handles Bunker C Fuel Oil. Rated at 350 G.P.M. 50 p.s.i., 10" vacuum, 20 h.p., 1150 r.p.m. motor drive. Built for Y tankers A.S.F.

SIER-BATH SCREW PUMPS

(INTERNAL GEAR TYPES)

WHEN the fluid is thick and the location inconvenient, you need Sier-Bath Screw Pumps. They are practically unaffected by angle of inclination, and their smooth, vibrationless operation permits installation where deep foundations are impossible. Having only two moving parts, they require little maintenance. Highly efficient over a broad flow range, Sier-Bath Screw Pumps are less affected by varying head pressures. ***They were the first screw pumps to incorporate needle bearings as standard design.*** Removable liners may be specified. Write for bulletin.

SIER-BATH GEAR CO. INC., 9254 Hudson Blvd., North Bergen, N. J.

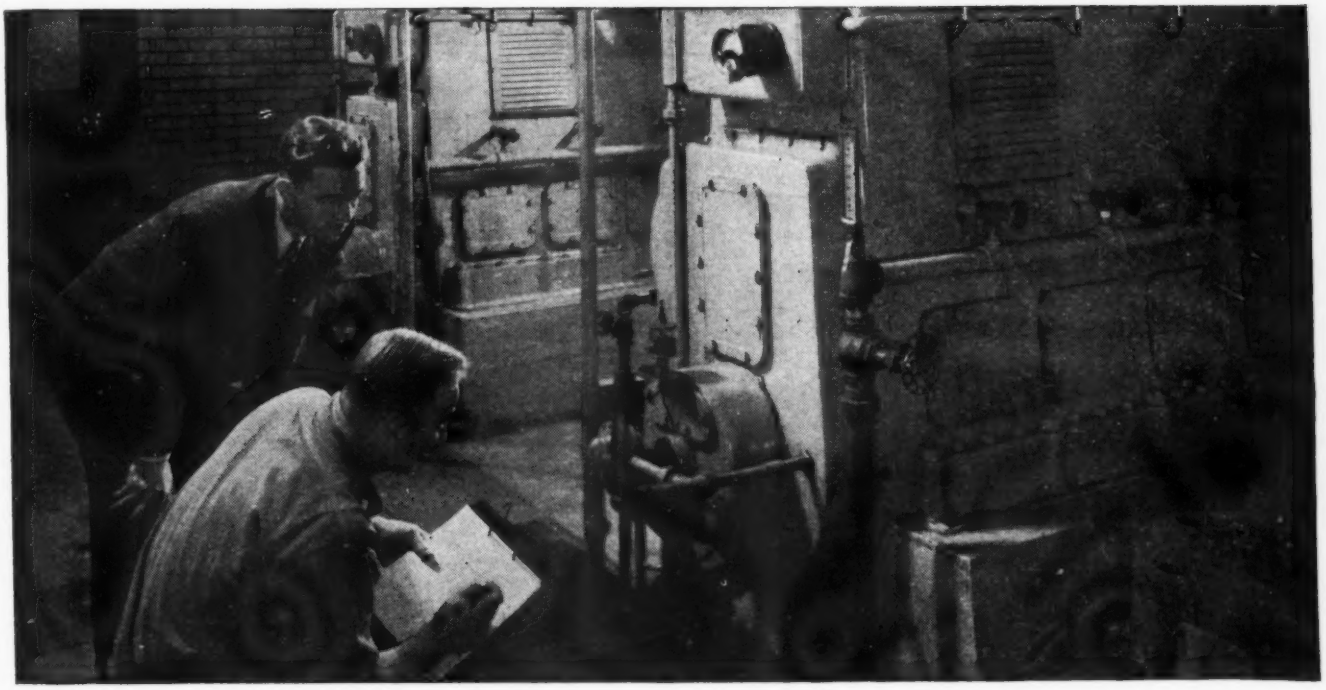
Sier-Bath Gear Co. Inc.

PUMP DIVISION

PUMPS:
Acetates—
Asphalt—Brine
Bunker C Fuel Oil
Cellulosics—
Greases—
Molasses—
Syrups—Soaps

GREATER RESISTANCE TO OXIDATION—

Another important advantage of the improved **GULF PARVIS OIL**



Before Gulf Parvis Oil was put in service to lubricate these Diesels, they required an overhaul every year. Now, because of reduced wear and less sludge and less valve deposits, the period between overhauls is over two years.

Greater resistance to oxidation— which means longer lasting protection—is just one of the important features of the improved Gulf Parvis Oil!

You can also get more effective protection of your Diesels through its higher lubricating value! And the remarkable anti-foam agent in Gulf Parvis Oil successfully prevents foaming regardless of operating conditions, yet in no way diminishes its lubricating qualities.

Call in a Gulf Service Engineer today and ask him to recommend the proper grade of Gulf Parvis Oil to fit your particular requirements. Write, wire, or phone your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company

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So He Called a Deming Distributor

Pump catalogs are an indispensable source of reference. The Deming "Library of Pump Data" includes a wealth of information in readily available catalogs and bulletins on the highly diversified line of Deming Pumps.

But no catalogs, however informative and authoritative, can match the LOCALIZED information of the Deming Distributor in your area.

In numerous instances, it is this LOCALIZED information "on tap" at your nearest Deming Distributor that points to a quick solution to a seemingly difficult or "unusual" pumping problem. When you call your Deming Distributor for help on almost any problem involving pumping equipment, the chances are good that he can show you how a comparable problem was solved successfully in a near-by plant.

This combination of *"know-how and know-where"* on the part of the Deming Distributor organization nearest your plant is beyond the scope of catalog compilation.

The quickest route to the right pump for specific needs is through your nearest Deming Distributor.

100% JOBBER AND DEALER POLICY

DEMING

THE COMPLETE LINE

PUMPS AND WATER SYSTEMS

The Deming Company · Salem, Ohio

100% STANDARD OF DEPENDABLE QUALITY

ONE *recognized standard*

THE COTTRELL PROCESS OF ELECTRICAL PRECIPITATION

FOR GAS CLEANING, smoke abatement and removal of dust, fume, tar and other suspended matter from gas, there has been one universally accepted process for more than thirty years. In answer to your special problem, a Cottrell installation incorporating this rich experience in research, development and worldwide operation means the complete fulfillment of your requirements.

RESEARCH CORPORATION

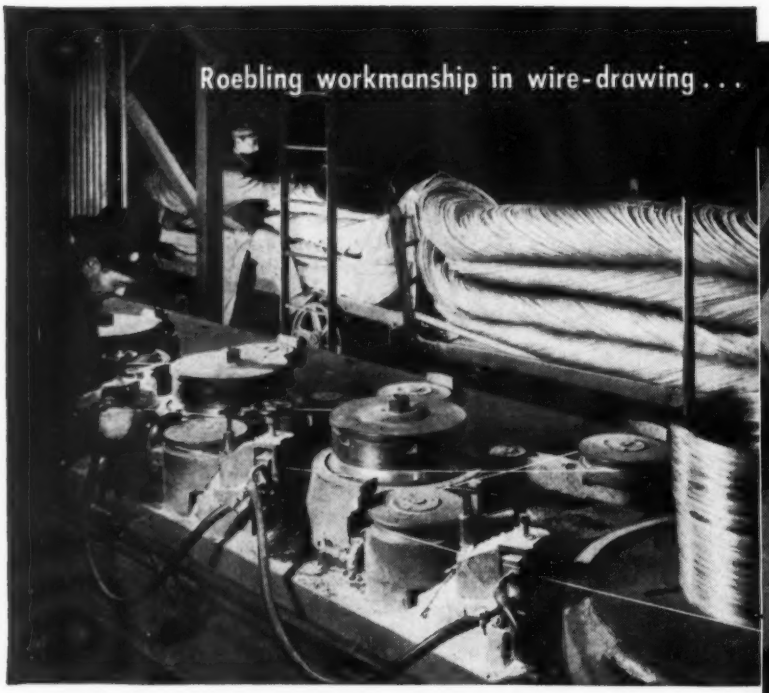
NEW YORK 17: 405 LEXINGTON AVENUE
CHICAGO 3: 122 SO. MICHIGAN AVENUE

Choose the right Rope

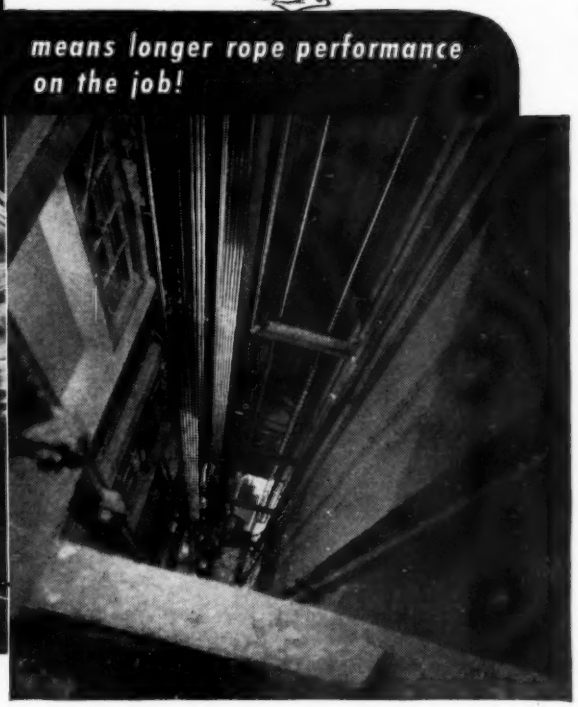
FOR SAFE, ECONOMICAL ELEVATOR SERVICE

Old Man Competition Is Getting Ready . . .

Roebling wire rope can help keep your costs down



Roebling workmanship in wire-drawing . . .



means longer rope performance on the job!

The safety and economy of elevator service depends on wire rope. This demands maximum flexibility and endurance. Roebling "Special Traction Steel" Elevator Rope has *proved* its ability to deliver just that.

This wire rope is tough . . . designed especially for the requirements of elevator service. Its flexibility gives you smooth operation. Its endurance gives you long life . . . stretching the length of service between those costly shutdowns.

Get the most in elevator safety plus the most in elevator economy. Write our nearest branch office today and a Roebling engineer will be glad to show you how.

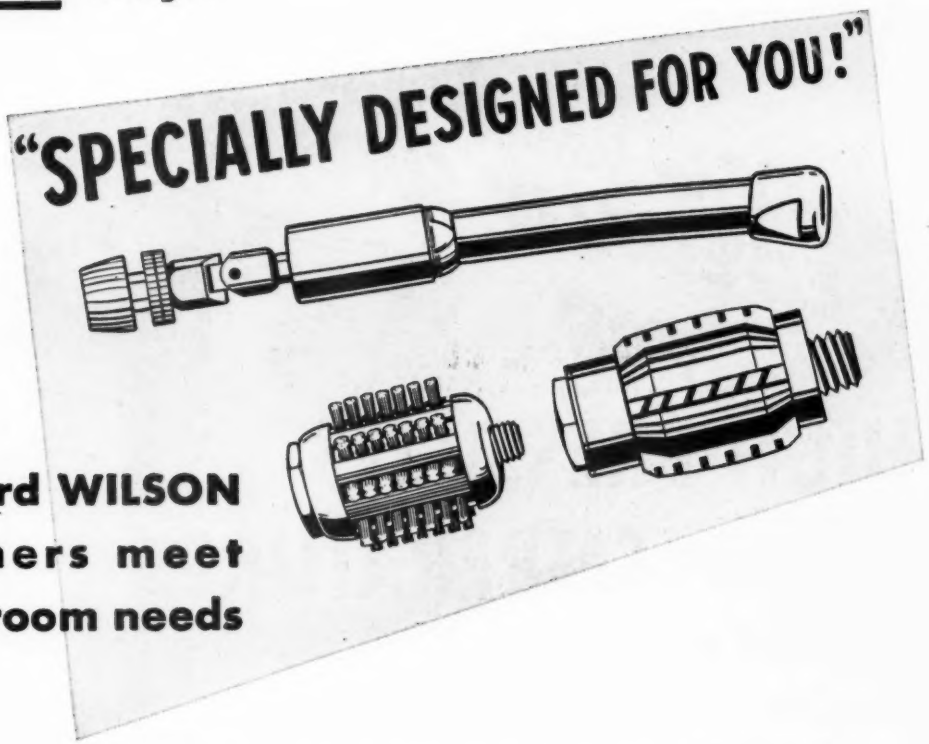
JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

WIRE ROPE AND STRAND • FITTINGS • SLINGS • SUSPENSION BRIDGES AND CABLES
COLD ROLLED STRIP • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS
AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • AERIAL WIRE ROPE SYSTEMS • ROUND AND SHAPED WIRE • ELECTRICAL WIRES AND CABLES • WIRE CLOTH AND NETTING

ROEBLING

PACEMAKER IN WIRE PRODUCTS

We could *almost* say:



How standard WILSON tube cleaners meet your boiler room needs

Constant research has enabled WILSON engineers to design *standard* tube cleaning equipment to meet many of the *special* needs of marine and power plant boiler tube cleaning. Here are three of the WILSON units recommended to fill these needs—and the reasons why they are recommended.

The "C" series motor—a small but unusually powerful motor specially designed for small tubes and short curves in marine and power plant tubing. It takes sharp bends with maximum power because it's made short without sacrifice of efficiency. It maintains high torque at operating speeds because its blades are held in close and constant contact with cylinder walls. This contact reduces air consumption—there's no needless air leakage. Its simple four-bladed steel blade construction allows either air or steam to be used as a driving medium and assures long service life.

WILSON Expanding Brushes—make fast work of removing the light powdery deposit usually found in boilers. They remove *all* the deposit because they expand within the tube—there's no vibration against the inner wall to hammer-down the brush elements or skip over bits of scale. They're long-wearing and economical because they can be restored to original efficiency after long usage by turning the brush cartridges end for end—because a patented construction feature prevents the tufts from being punched through—and because an easily replaceable retainer cap is provided to bear the brunt of wear on the front end.

Wilson Expanding blade-type scraper heads—are ideally suited for use where light scale or gummy deposits are found. They can often slash down-time to a minimum; their scraping action cleans where gummy deposits clog the cutter wheels of other heads.

A copy of the Wilson Tube Cleaners Check List will help you select the right Wilson equipment to do your tube cleaning jobs faster and more effectively. Write for your copy today. Please address department M.

THOMAS C. WILSON, INC.

21-11 44th Avenue, Long Island City 1, N. Y.

WILSON

TW-706

TUBE CLEANERS

You Can See for Yourself . . .

WHY the Foster 38-SV Safety Valve is ESPECIALLY SUITABLE FOR

HIGH PRESSURES HIGH TEMPERATURES

Pressures up to 3000 pounds and temperatures of 1000° F. are easily handled by the Foster Type 38-SV Super-Jet Safety Valve—it was designed especially for just these exacting requirements! It's no mere "beefed-up" low-pressure valve—rather it's a basic new design for high-pressure service.

Only the Foster 38-SV Safety Valve gives you all these advantages:

1 . . . ***Exceptional steam economy*** because . . . it reseats as low as 1% below popping pressure . . . reseating is positive; without pounding or chatter . . . blowdown is adjustable from 8% down to 1%.

2 . . . ***Unaffected by temperature changes*** because . . . frame rod construction makes crawl negligible . . . deflector protects spring and rods from escaping steam.

3 . . . ***Maximum protection*** because . . . full opening is practically instantaneous . . . full rated nozzle capacity is available at popping pressure . . . once set under operating conditions, its popping point is constant.

4 . . . ***Positive reseating*** because . . . floating disc design . . . steam-centered piston . . . permanently flat seats.

Specify the Foster 38-SV Super-Jet Safety Valve for the finest in high-pressure protection!

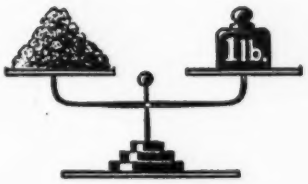
Complete details of the Foster 38-SV Super-Jet Safety Valve, for pressures up to 3000 pounds and temperatures up to 1000° F., are given in Bulletin 25. Write for it today!

FOSTER ENGINEERING Company

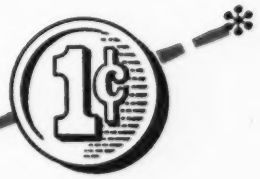
PRESSURE REGULATORS . . . RELIEF AND BACK PRESSURE VALVES . . . AUTOMATIC STOP AND CHECK VALVES . . . ALTITUDE VALVES . . . DAMPER REGULATORS . . . FAN ENGINE REGULATORS . . . PUMP GOVERNORS . . . TEMPERATURE REGULATORS . . . LIQUID LEVEL CONTROLLERS . . . FLOAT AND LEVER BALANCED VALVES . . . NON-RETURN AND TRIPLE DUTY VALVES . . . VACUUM REGULATORS OR BREAKERS . . . SIGHT FLOW BOXES . . . STRAINERS . . . SAFETY VALVES . . . SIRENS

106 MONROE STREET • NEWARK 1, N. J.

CAN YOU PREVENT THIS MUCH BOILER SCALE?



FOR THIS?



Amberlite Softening Treatment

ENDS BOILER SCALE AT LOW COST!

Here's an end to costly boiler scale! Regardless of water supply or fluctuation in quality, you can stop boiler scale before it starts with the AMBERLITE ion exchange softening treatment.

By passing the raw water through beds of AMBERLITE ion exchange resins the scale-forming magnesium and calcium ions are removed *before* the water enters the boiler—reducing supplementary phosphate treatment and lowering blow-down losses. Operating costs of the AMBERLITE treatment are low— the cost of regenerating the resins between cycles averages *less than one cent per pound of boiler scale prevented.*

Additional advantages of the AMBERLITE softening treatment are:

- Complete softening
- Minimum maintenance requirements
- Low space requirements
- Simplicity and flexibility of operation
- High throughput
- Uniformity of treated water supply

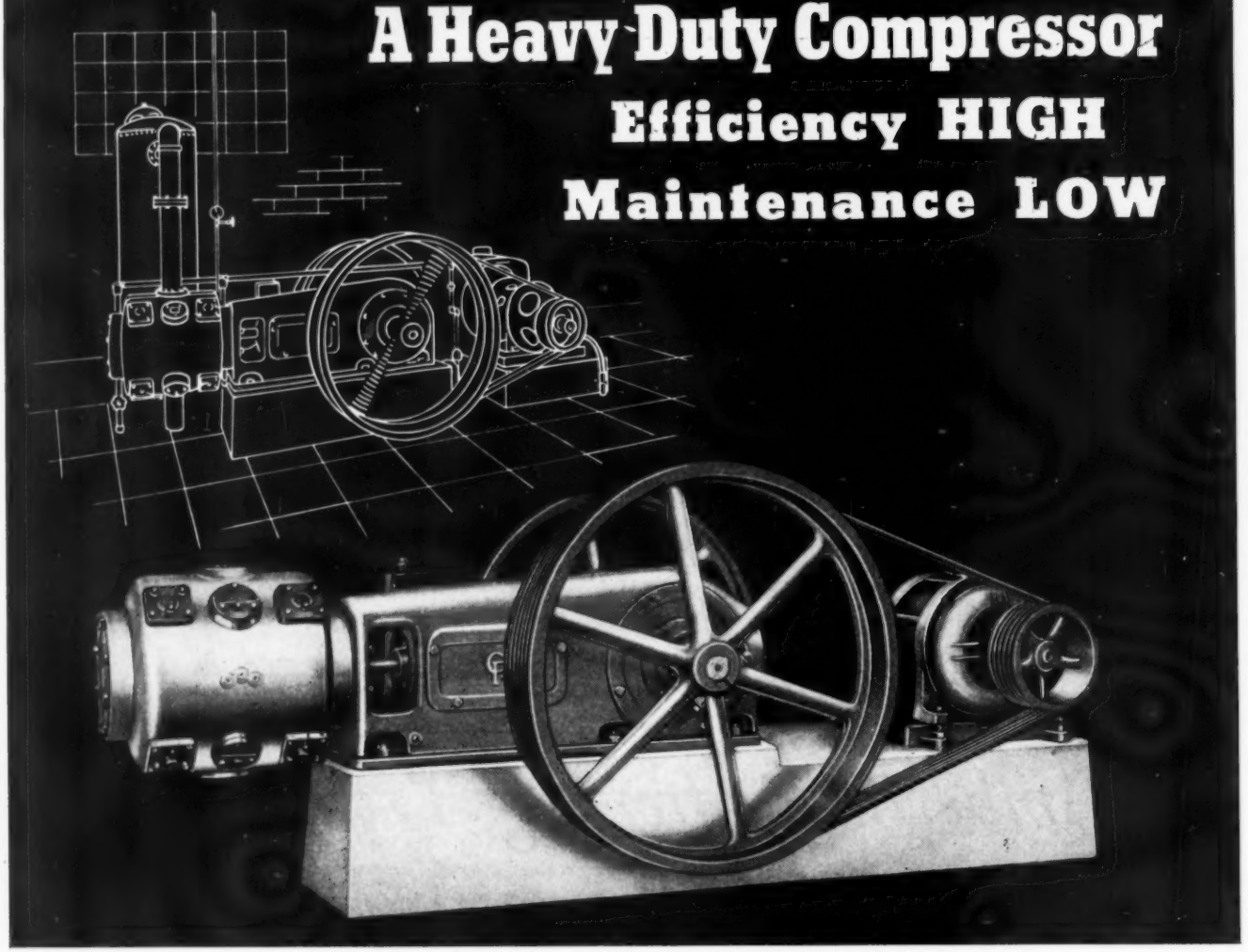
Consult our technical staff for complete information regarding the use of the AMBERLITE ion exchange resins in your own power plant.

AMBERLITE *is a trade-mark, Reg. U. S. Pat. Off.*

THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

A Heavy Duty Compressor
Efficiency HIGH
Maintenance LOW



HOWEVER hard and continuous the operation, the Chicago Pneumatic Type T Compressor always can be relied upon for dependable and economical performance—with a minimum of maintenance. Its superior service results from such features as Simplate air valves, tapered roller main bearings, one-piece trouble-proof crosshead, and effective water jacketing.

The CP Type T Compressor is of the horizontal, double-acting, water-cooled type; arranged for belt, direct-connected motor or steam drive. Sizes range from 15 to 125 hp, in single-stage design for pressures up to 150 pounds; in multi-stage units for pressures up to 5,000 pounds. Write for Bulletin 728.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
HYDRAULIC TOOLS
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

Eliminate DAMAGING WATER and OIL from Your Compressed Air Lines

WITH

ADAMS AFTERCOOLERS and CYCLONE SEPARATORS

Air Cooled to Within 10 DEGREES of Cooling Water! EASILY INSTALLED! Pipeline Construction

ADAMS equipment insures a constant supply of cool, moisture-free, oil-free air to power your compressed air tools with the highest efficiency and safety . . . at the *lowest* installation and maintenance cost.

ADAMS AFTERCOOLERS are *guaranteed* to cool air to *within 10 degrees* of your cooling water. This means *extra* thoroughness in condensing water and oil vapors from your compressed air.

NO FOUNDATION or other facilities are required for installation. The Adams "pipeline" construction permits the After-cooler and Cyclone Separator to fit right into a section of the pipe line . . . either vertically or horizontally!

CYCLONIC SEPARATION is the Adams principle . . . engineers agree that it is *far more efficient* than other mechanical separation!

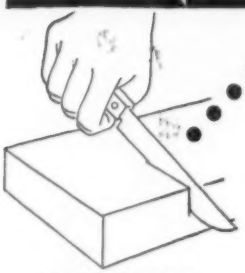
WRITE!

today for full engineering data on improved pneumatic power performance. Ask for Bulletin 703.

R. P. ADAMS CO., INC.

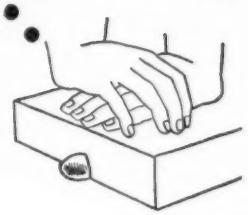
67 Chicago St., Buffalo, N. Y.

ADAMS AFTERCOOLERS and CYCLONE SEPARATORS



CUTS EASILY

EAGLE SUPERTEMP BLOCK INSULATION is easy to apply!



FITS SNUGLY

Eagle Supertemp Block is lightweight, easy-to-handle. It cuts like cheese with a knife or saw to fit odd-shaped areas. Fits snugly over minor irregularities, such as rivet heads.

Cuts heat losses to the bone!

Because it's basically Mineral Wool, Supertemp Block is literally honeycombed with dead air cells. From these highly effective heat barriers, it derives extremely low thermal conductivity... and becomes one of the most efficient insulations you can install!

Other Supertemp Block advantages

Great strength. Despite its light weight, Supertemp Block has good transverse breaking strength. Withstands all normal handling and usage.

All-purpose—only one type block needed.

High Refractory Value. Withstands a full range of temperatures up to 1700° F.

Water-Repellent. Actually floats on water. Absorption is negligible.

Permanent. Physically and chemically stable. Will not deteriorate. Data sheets with complete technical information are available on request.

To speed application of Eagle Supertemp Block, we recommend Eagle Insulstic, a strong, paste-like adhesive that holds insulation in place during application.

OTHER EAGLE INDUSTRIAL PRODUCTS INCLUDE:

EAGLE INSULSEAL. A protective coating for insulation. Trowels on—dries to a hard finish. Withstands up to 450°F.

EAGLE SWETCHEK (black). A prepared, asphaltic base, rust-inhibitive anti-condensation compound.

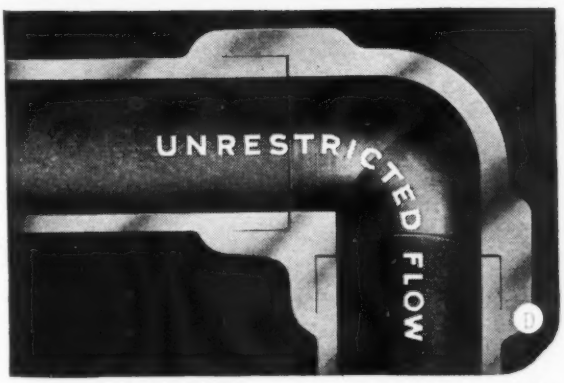
EAGLE "43" FINISHING CEMENT. A hard white finish coating for all types of indoor insulation within a range from 70° F. to 800° F.

EAGLE-PICHER INSULATIONS
High and Low Temperature

EAGLE EP PICHER

Made by THE EAGLE-PICHER COMPANY • CINCINNATI (1), OHIO

Eagle Super "66" Insulating Cement • Eagle L-T and M-2 Felt • Eagle Supertemp Block • Eagle Blankets • Eagle Pipe Covering
Eagle Insulseal • Eagle Loose Wool • Eagle Insulstic • Eagle Swetchek



LEAK PROOF! PERMANENT!

Watson-Stillman Drop Forged Steel Fittings
Socket Welding Type
2000, 3000, 4000 and 6000 lb.
Cold Working Pressure

Watson-Stillman Socket Welding Fittings are especially designed for welding and conform to the proposed American Standards. They are easy to use and will greatly simplify difficult piping installations through their clean outside welds.

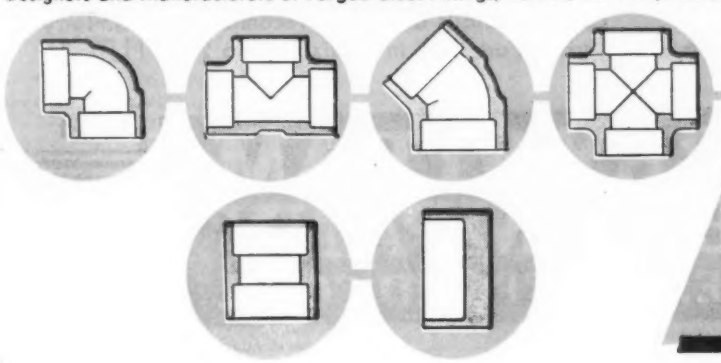
Three simple steps: (A) Cut pipe to size and insert in fitting. Deep socket supports and aligns the pipe, eliminating tack welding and the use of special fixtures. (B) Make a clean outside-the-pipe fillet weld. Position of weld prevents welding icicles inside pipe—no clogged lines. (C) The fitting and pipe are fused into one integral unit permanently tight and leak-proof. Unaffected by vibration, distortion and shock. (D) Unrestricted flow.

These fittings are for use with Schedule 40, Schedule 80, Schedule 160 and Double Extra Strong Pipe. Each class is made in Carbon Steel, Carbon Molybdenum Steel, Chromium Molybdenum Steel and various types of Stainless Steel.

Get the complete story on Socket Welding and Screw End Fittings by requesting Bulletin A-3. The Watson-Stillman Co., Roselle, New Jersey.

Sold Through Leading Distributors

Designers and Manufacturers of Forged Steel Fittings, Valves, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

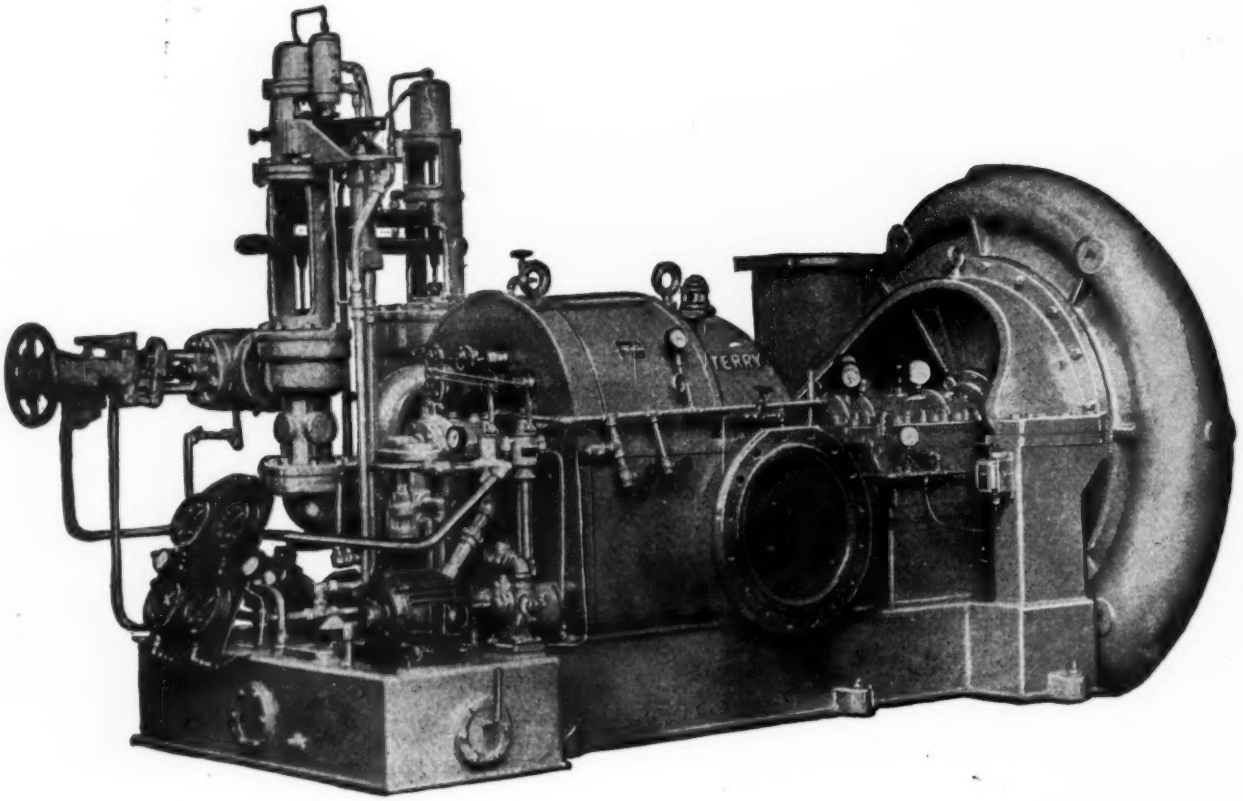


WATSON-STILLMAN

DISTRIBUTOR PRODUCTS DIVISION

1276

The TERRY TURBINE



SPECIAL MULTI-STAGED TURBINES ENGINEERED TO FIT YOUR REQUIREMENTS

Pictured above is a typical special purpose Terry Turbine. This unit is rated 332 H.P. and can be operated under any of the following conditions:

(1) As a straight high pressure condensing turbine.

(2) As a straight low pressure condensing turbine, thereby converting any excess low pressure steam into power.

(3) As a mixed pressure turbine. It will then absorb all the low pressure steam available and admit just enough high pressure steam to carry the load.

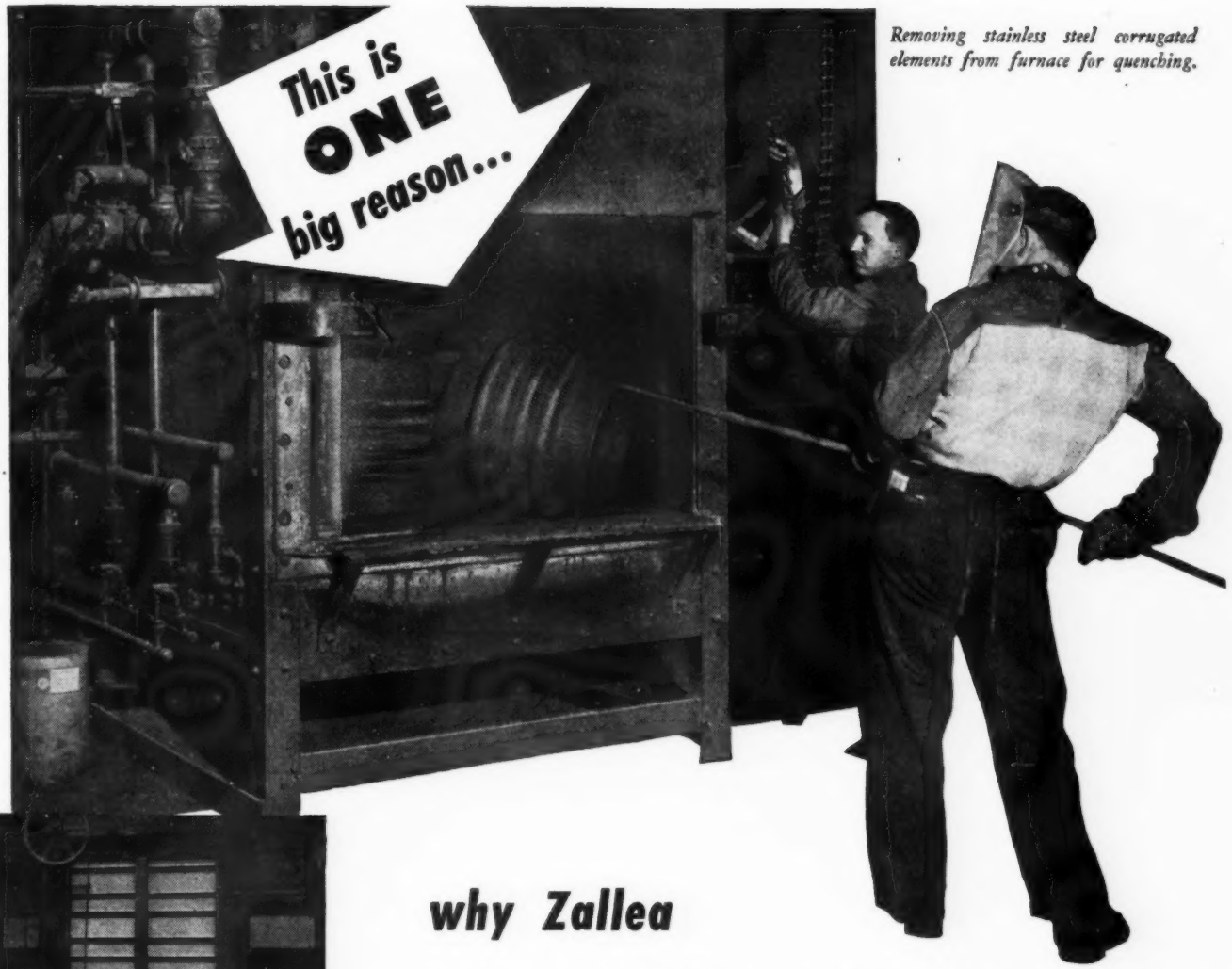
(4) As a condensing bleeder turbine. It will supply clean low pressure steam for heating or process work.

(5) Under all conditions the speed can be varied from 2800 R.P.M. to 4750 R.P.M.

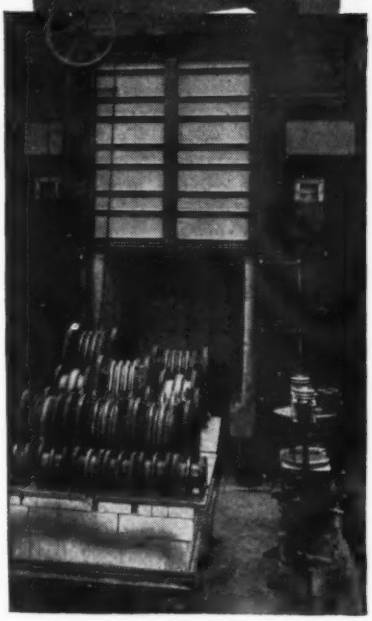
If you have an application for a special purpose multi-staged turbine, Terry will be pleased to discuss the details and make recommendations. Terry Turbines are built in all sizes up to 2000 H.P.

T 1161

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.



Removing stainless steel corrugated elements from furnace for quenching.



Charging a furnace with copper expansion joints for final anneal.

Zallea Corrugated Expansion Joints are made in non-equalizing, self-equalizing and Duo-equalizing types, depending upon the conditions under which they must operate . . . of copper, stainless steels and other corrosion-resistant alloys . . . diameters from 3" upward . . . traverses up to 7½" . . . for pressures from vacuum to 300 psi . . . for temperatures from sub-zero to 1600° F.

For complete descriptions and specifications write for Bulletin 46 now in preparation, or ask us to quote on your requirements.

why Zallea Corrugated Expansion Joints Endure

During fabrication and after the final forming operation all Zallea Expansion Joints are given a full anneal to remove all stresses left by the forming operation. Proper heat treatment is essential to secure the maximum potential life of any corrugated expansion joint.

Although this heat treatment varies with the metal, in every case the corrugated element must be slowly and uniformly heated to a predetermined temperature, held there for a definite time, then cooled at a definite rate. Obviously, this cannot be accomplished by local annealing with torches—the method most often used in the manufacture of corrugated expansion joints.

All Zallea Expansion Joints are properly heat treated in gas-fired furnaces equipped with temperature controls capable of maintaining temperatures constant within 25° at any point up to 2000° F. Recorders provide a permanent record of each heat.

"Code-Craft"...

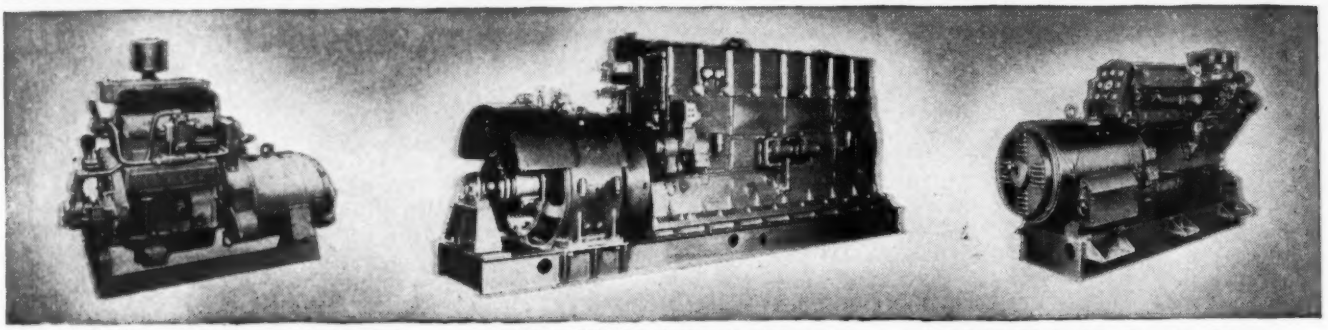
ZALLEA BROTHERS & JOHNSON

...EQUIPMENT FOR THE PROCESS INDUSTRIES

814 LOCUST ST. • WILMINGTON 99, DEL.

Specify and Demand ZALLEA Furnace-Annealed Expansion Joints

BUILDING GENERATORS
TO FIT THE ENGINE...
Our Business Since 1891



Burke Type we, DC Generator Buda Diesel Driven.

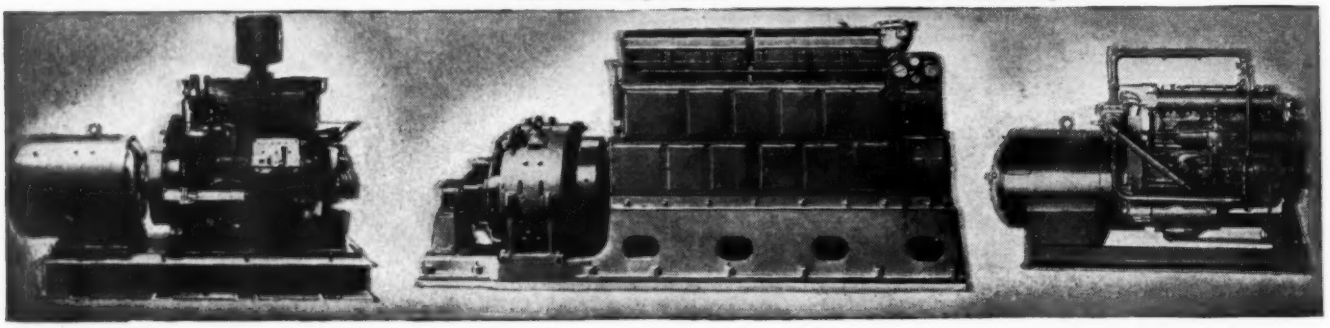
Burke 40 kw, DC Marine Type Generator.

Burke 150 kw, DC Generator Driven by Atlas Diesel.

Burke 150 kw, 450 RPM — DC Generator for Marine Diesel Engine Drive.

Burke 30 kw, DC Generator Driven by Cummins Diesel.

Burke 30 kw, DC Generator Driven by Hercules Engine.



ENGINE builders find Burke a dependable source for specially built generators. Hundreds of Burke generators are teamed up with leading engines to produce efficient power units for the job.

Burke as one of the oldest and largest independent builders of AC & DC generators has over 55 years of specialized experience in this field. When you purchase an engine-generator unit, make sure your generator measures up to the engine you select — ask for Burke generator recommendations, for it's our business to design and build the best generator for the engine of your choice.

For a description of the complete Burke line of AC and DC motors and generators, consult Sweet's Engineering catalogs or Electrical Buyers Reference catalog.

For immediate assistance, contact our nearest representative:

ATLANTIC ENGINEERING CO.
185 17th Street, N. E., Atlanta, Ga., Phone: Hemlock 6461

J. T. COOPER
Room 1515 Engineering Bldg.,
205 West Wacker Drive, Chicago, Ill.,
Phone: Franklin 5061

C. E. WINCHELL
205 Perry-Payne Bldg., Cleveland, O., Phone: Cherry 5634

CARL D. MILLER
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9595 Gartiot Avenue, Phone: Plaza 7232

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Phone: Raymond 8241

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Room 234, 1600 Arch Street, Philadelphia, Penna.,
Phone: Rittenhouse 5226

F. E. BURKE
416 Maple Ave., Pittsburgh, Penna., Phone: Penhurst 5337

P. A. MORSE
Morse Engineering Co., Room 600
Fullerton Bldg., St. Louis, Missouri, Phone: Garfield 0076

RALPH JAMES—Northwestern Agencies, 2411 First Ave., Seattle, Wash., Phone: Eliot 8882

MOTORS 1 TO 1500 H. P. • GENERATORS 1 TO 1000 K. W.

BURKE A.C. & D.C. Motors & Generators

BURKE ELECTRIC COMPANY, ERIE, PENNSYLVANIA • *Since 1891*

KELLOGG

Solves the Most Complex Piping Design Problems Scientifically

The Kellogg Scientific Method of Determining Moments and Forces Electrically, by the use of a scale model testing apparatus, capable of measuring load deflections to one millionth of an inch, has solved many complex and highly specialized pressure and temperature problems.

This scientific design research is available to consulting, power, process and marine engineers.

Write today for copy of bulletin "Analyzing Piping Stresses by Tests of Models."

KELLOGG "Masterflex" Prefabricated Piping Systems • "Masterweld" pressure vessels for Power, Refinery and Chemical Industries. Heat Exchangers. Pyrolytic and Catalytic Cracking Units, Hydroforming, Reforming, Dehydrogenation, Alkylation, Desulphurization. Thermal and Catalytic Polymerization Units • JUIK Processes for Lubricating Oil Plants. Plastic Refractories • Radial Brick Chimneys.

THE M. W. KELLOGG COMPANY • JERSEY CITY, NEW JERSEY • 225 BROADWAY, NEW YORK 7, N. Y.

REPRESENTATIVES

LOS ANGELES: 609 SOUTH GRAND HOUSTON 2, TEXAS: 402 ESPERSON BLDG. TULSA: PHILTOWER BLDG.

TURBINE LUBRICATION

Turbine Oil gives 34 SERVICE HOURS per Gallon over 6 YEAR PERIOD

Extent of conditioning has been to run oil through centrifuge at only 3 intervals during entire time

"The service record of the 25,000 KW Unit in The Empire District Electric Company's Steam Turbine plant located at Riverton, Kansas, covers a six year period — beginning April, 1939.

Lubrication Engineer's Report

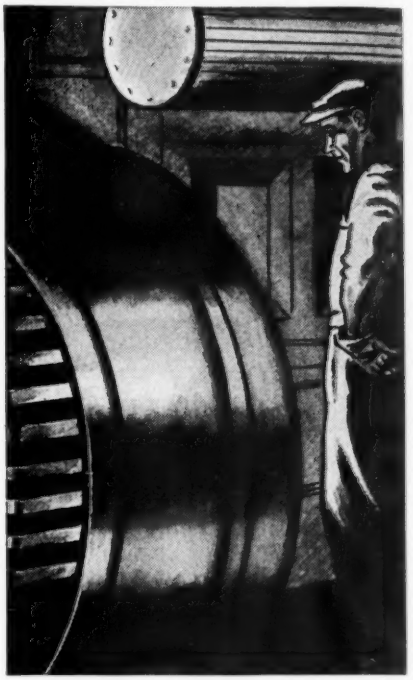
"During this time the *same* oil has been in use and 'make-up' has totaled 1,431 gallons, or an average of 34 service hours per gallon of make-up. Quantity of oil in the oiling system is 1,100 gallons. Neutralization number on oil at start of this run was .05 mg. KOH; maximum value reached was .320 mg. KOH; the average value was .208 mg. KOH; and present value .250 mg. KOH.

"There has been no draw-off of oil to add "sweetening." The make-up added has been to compensate for losses due to vaporization, leakage and such losses as occur during routine machine inspections.

"The extent of the conditioning this oil received has been to run it through a centrifuge at three intervals in the six years to remove any accumulated moisture resulting from condensation in the reservoir.

Moisture Content Negligible

"One of the reasons for the successful performance of the Cities Service turbine oil is the method used to vent the system of vapors. The hot oil return from the bearings to the reservoir, empties into a chamber carrying the screens to remove foreign particles that might damage the oil circulating pumps. A considerable vapor is liberated at this point (oil temperature, 150-160 deg. F.), and instead of being permitted to condense is drawn off through a vent line, under a slight vacuum. While there is a tangible loss of oil in the

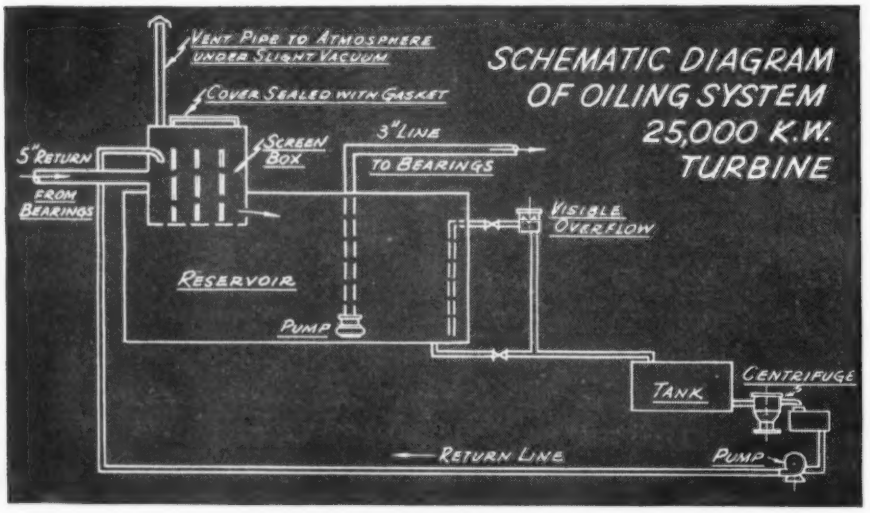


vapor, the moisture content is held practically negligible and is, therefore, of material help in maintaining the oil in good condition.

"The above is typical of the experience with Cities Service turbine oil in each of Empire's five turbo-generator units."

Expert Counsel Available

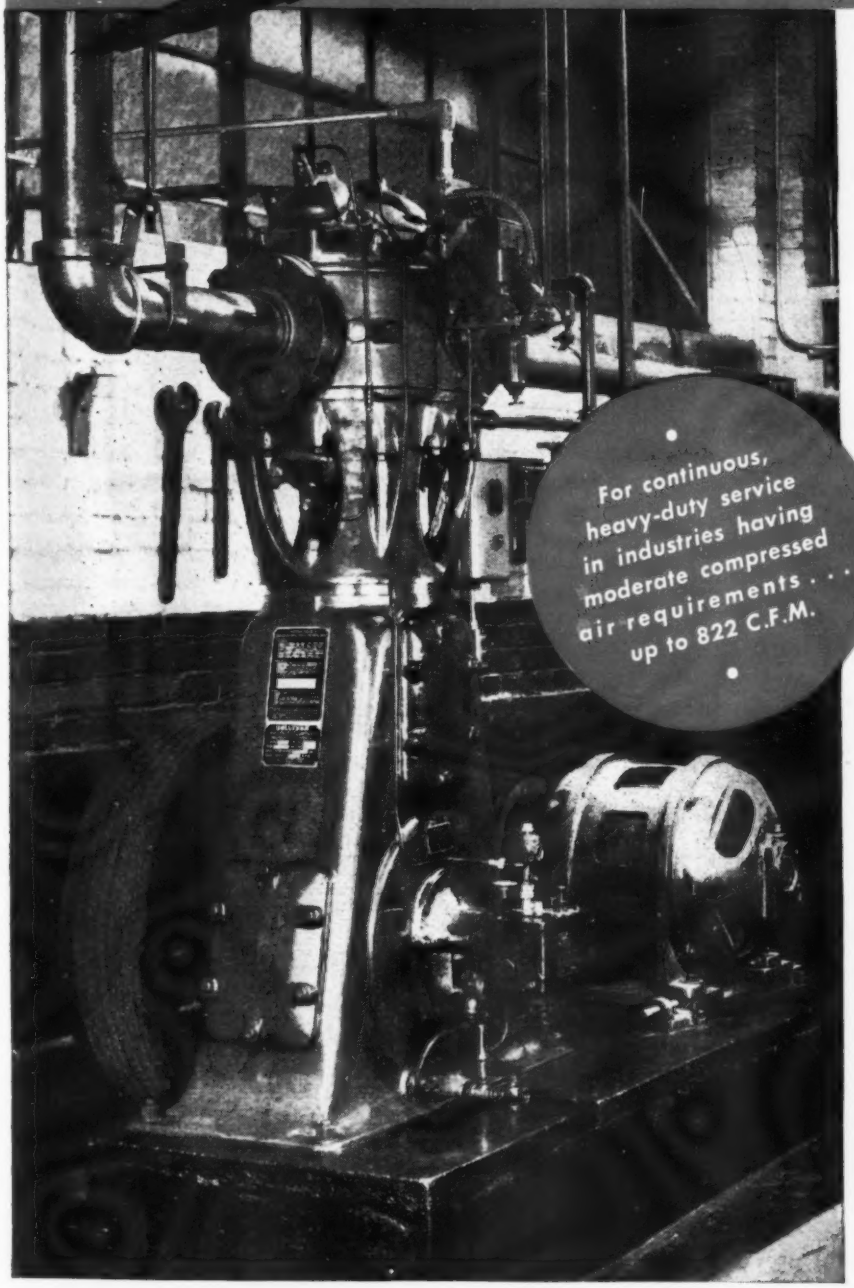
Cities Service Lubrication Engineers know ways and means for reducing costs and improving the performance of lubricants. For help or information call the branch office nearest you, or write Cities Service Oil Co., 60 Wall Tower, New York 5, N. Y.



CITIES SERVICE OILS
ONCE-ALWAYS

FOR EVERY LUBRICATION PROBLEM CALL Cities Service FIRST!

the WG-9 another Sullivan modern, heavy-duty compressor



• The Sullivan WG-9 air compressor is ideally suited for plants with moderate volume requirements or for specialized uses in large plants particularly where limited floor space is available. It is a double-acting, heavy-duty, single-stage compressor that will stay on the job twenty-four hours a day with the very minimum of maintenance.

Long, trouble-free operation is assured by:

(1) Cylinder liners replaceable ON THE JOB

(2) Full force-feed lubrication to all working parts

(3) Sullivan patented, long-life, DUAL-cushion valves

(4) Anti-friction main bearings.

Because of its smooth-running characteristics and the small floor area required, the WG-9 needs only a simple, block-type foundation which can be quickly, easily and cheaply installed right where the air is needed. Available in eleven sizes with displacements from 153 to 822 C.F.M. at pressures from 30 to 150 pounds. Send for Bulletin A-43 for complete details. **Sullivan Machinery Co., Michigan City, Indiana. In Canada: Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.**

☆

SULLIVAN

THE WORLD'S FINEST AIR COMPRESSORS FROM 1/4 TO 3,000 H. P.

OFFICES

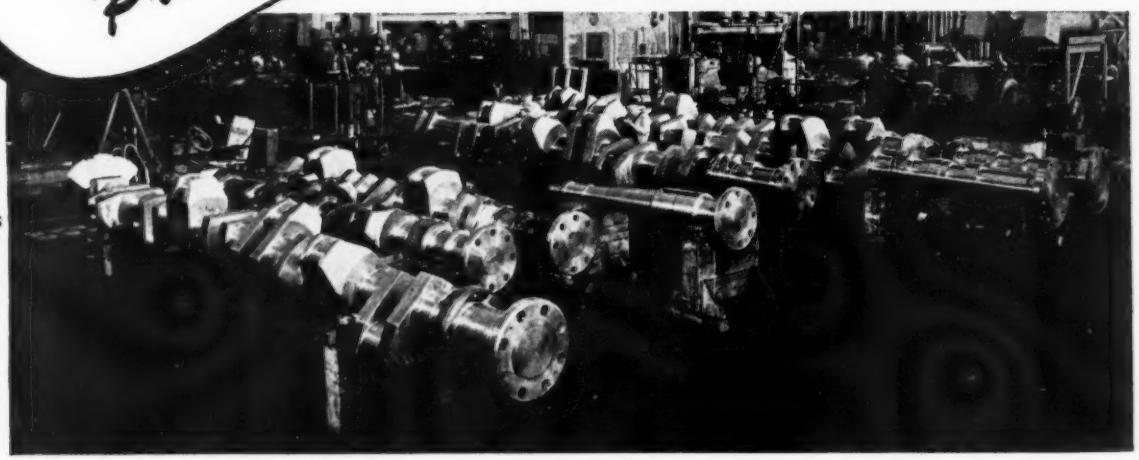
Birmingham - Boston - Butte - Chicago - Claremont - Dallas - Denver
Duluth - El Paso - Huntington - Knoxville - Los Angeles - Middlesboro
New York - Philadelphia - Pittsburgh - Portland - Salt Lake City - Seattle
San Francisco - Spokane - St. Louis - Washington, D. C.

PRODUCTS

Stationary and Portable Air Compressors, Pneumatic Casting Grips, Foundation Breakers, Portable Hoists, Rock Drills.

Equipped for QUANTITY and QUALITY Production

One 6000 and five 2400 horsepower Diesels under construction at one end of the Nordberg erecting shop.



Fitting-up crankshafts for Nordberg Diesels.

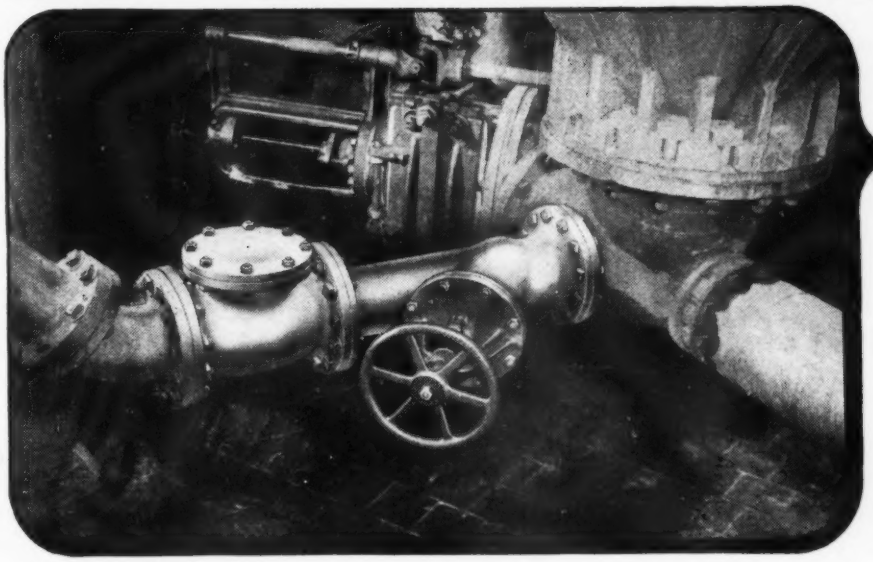
MODERN manufacturing facilities and the accumulated experience of more than fifty years in building heavy duty machinery are combined in Nordberg Diesels to give to users of these engines the utmost in dependable and economical power. This better performance is evident in the excellent records established by Nordberg Diesels. Many of the largest Diesel plants in the Western Hemisphere are Nordberg powered —many of the finest ships are Nordberg propelled. When in need of power, investigate the merits of Nordberg Diesel engines. There is a size and type for your particular need.

NORDBERG MFG. CO., MILWAUKEE 7, WISCONSIN

NORDBERG
DIESEL ENGINES

ALOYCO STAINLESS STEEL VALVES

.. install them and forget them



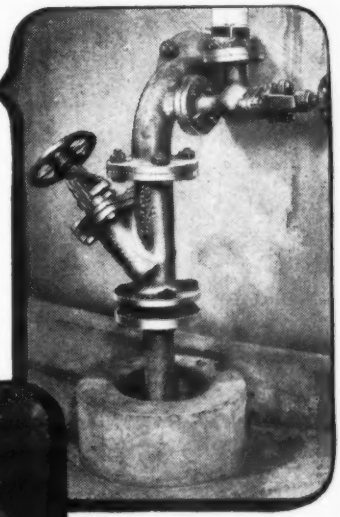
HANDLING HOT SULFITES SINCE NOVEMBER 18, 1929

6" Aloyco Check Valve and 6" Aloyco "Y" Valve handle hot calcium bisulfite solution containing 6 to 7% total SO_2, and 5 to 6% free SO_2. Also, note 10" Aloyco Blow Valve in rear.

Photos Courtesy of Eastern Corporation

ALSO INSTALLED NOVEMBER 18, 1929

2½" Aloyco Side Relief Valve handles hot calcium bisulfite solution containing about 3% total SO_2. The ¾ inch angle sampling valve shown is also an Aloyco.



HOT RELIEF AND COLD ACID

This 8" Aloyco "Y" Valve handles relief containing up to 85% SO_2 and cold acid.

● Are you valve conscious? Do corrosion, contamination, abrupt temperature changes and other rigorous service conditions give you valve trouble? If so, it will pay you to get in touch with us and find out how Aloyco Valves in the correct analysis of stainless steel can help you "install them and forget them."

The photographs here show Aloyco Stainless Steel Valves in operation in the paper mills of Eastern Corporation since 1929—and still going strong. They are used in the toughest spots in the sulfite mill for blowdown and relief line service.

Aloyco Valves are available in a wide range of stainless steels and corrosion resistant alloys. Large selection of types and sizes for 150 p.s.i. to 600 p.s.i. service. Write today for detailed information.

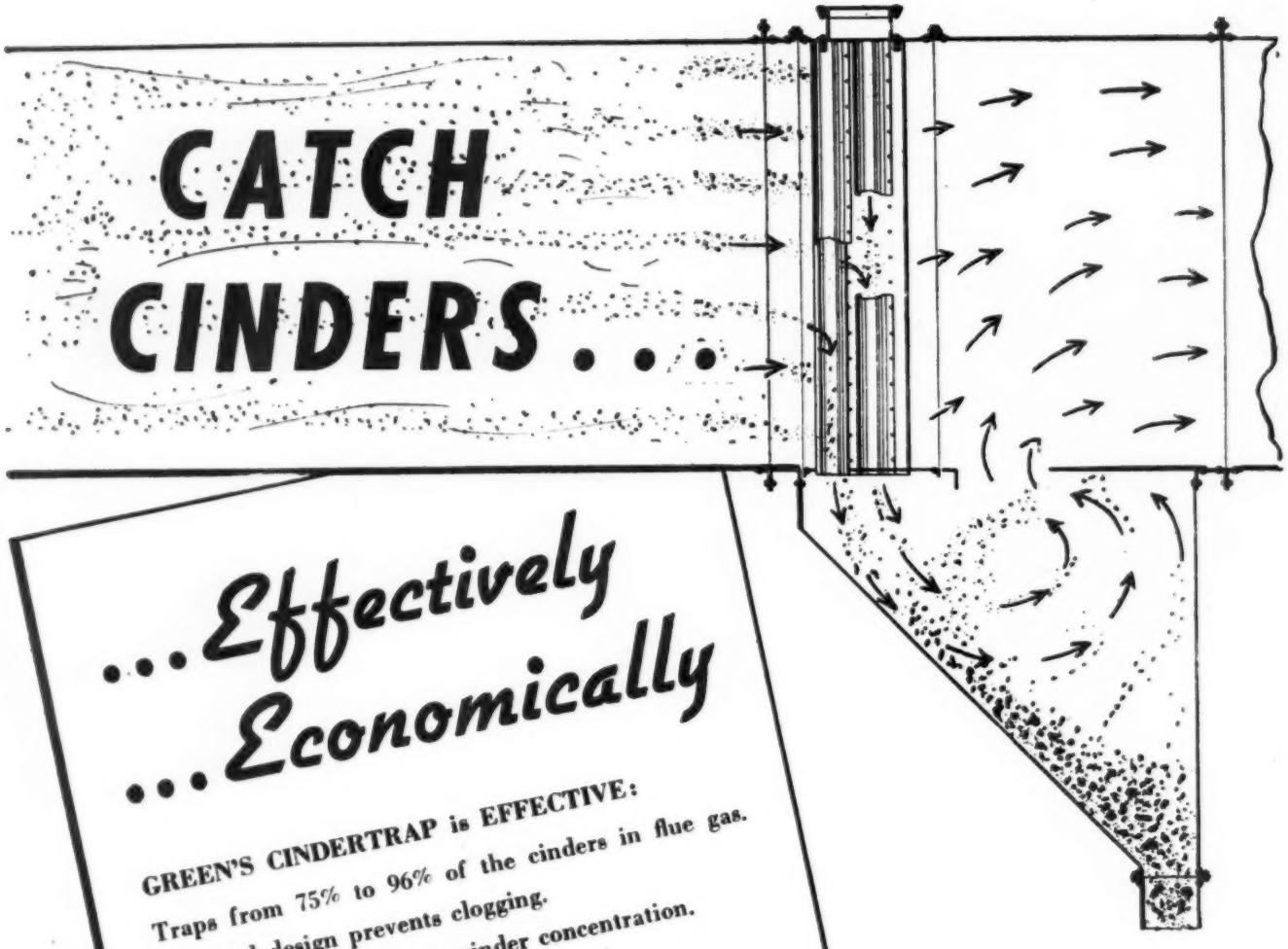
ALOYCO

STAINLESS STEEL VALVES AND FITTINGS

GATE, GLOBE, Y, CHECK, TANK, SAMPLING AND V-PORT VALVES
SCREWED, FLANGED AND WELDED FITTINGS

ALLOY STEEL PRODUCTS COMPANY, INC.

1403 WEST ELIZABETH AVE. • LINDEN, N. J.



CATCH CINDERS . . .

. . . Effectively . . . Economically

GREEN'S CINDERTRAP is EFFECTIVE:

Traps from 75% to 96% of the cinders in flue gas.
Patented design prevents clogging.
Unaffected by changes in cinder concentration.

GREEN'S CINDERTRAP is ECONOMICAL:

Low initial cost
Fits readily into existing systems
No moving parts
No water spray
Low draft loss (0.2" maximum)
Efficient for stokers
Long life

MANY REPEAT ORDERS testify to the satisfaction users experience with GREEN'S CINDERTRAPS.

NO REPLACEMENT PARTS have ever been required.

NOTE THESE REPEAT ORDERS

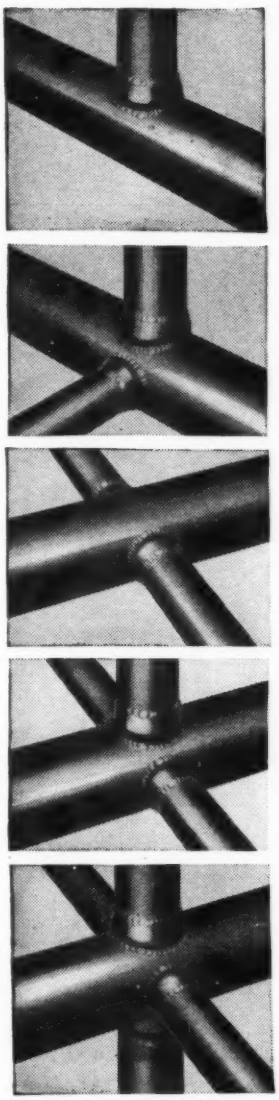
Boston Elevated Ry. Co.
Brooklyn Edison Co.
Calco Chemical Co.
City of Fort Wayne, Ind.
City of Wyandotte, Mich.
Continental Paper Co.
Defense Plant Corp.
Eastman Kodak Co.
Fitchburgh Gas & Electric Co.
General Electric Co.
Hudson Coal Co.
Interboro Rapid Transit Co.
Knott Hotels Corp.
Lorain Steel Co., Johnstown, Pa.
New York Navy Yard
Pennsylvania R.R. Co.
Pullman-Standard Car Mfg. Co.
Stone & Webster Engrg. Corp.
J. G. White Engrg. Co.

THE **GREEN** *Fuel Economizer* **COMPANY** INC.

BEACON NEW YORK

FORCED AND INDUCED DRAFT FANS • FUEL ECONOMIZERS • AIR PREHEATERS

WELDOLET FITTINGS



WeldOlets are available in three types—Welding Outlet, Threaded Outlet, and Socket Outlet.

MAKE BRANCH PIPE OUTLET JOBS EASY

● Branch pipe outlet jobs can be done quickly, easily and permanently if you use WeldOlet Fittings. These modern fittings are designed expressly for their job. They require a minimum amount of space thus making possible joints like those illustrated.

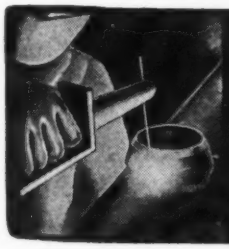
In addition to their ease of installation, WeldOlet Fittings provide full pipe strength at the joint—eliminate possible weak spots at the branches. Flow conditions are improved too because of the funnel shaped inlet into the fittings. This funnel reduces turbulence permitting full capacity flow into the branch line.

Take advantage of the many features these modern fittings offer you on your next piping job. Write today for the new WeldOlet Catalog which contains complete information on why, where and how to use WeldOlet Fittings.

Forged Fittings Division

BONNEY FORGE & TOOL WORKS · 342 Green St., Allentown, Pa.

BUY MORE BONDS AND KEEP THEM

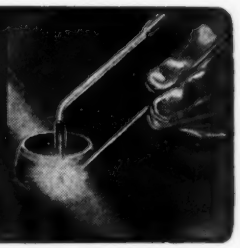


WELDOLETS

TRADE MARK REG. U. S. PAT. OFF. PAT. IN U. S. & FOREIGN COUNTRIES

WELDING OUTLET - THREADED OUTLET - SOCKET OUTLET

For Welded Branch Pipe Outlets



SARCO 87

Low cost temperature control

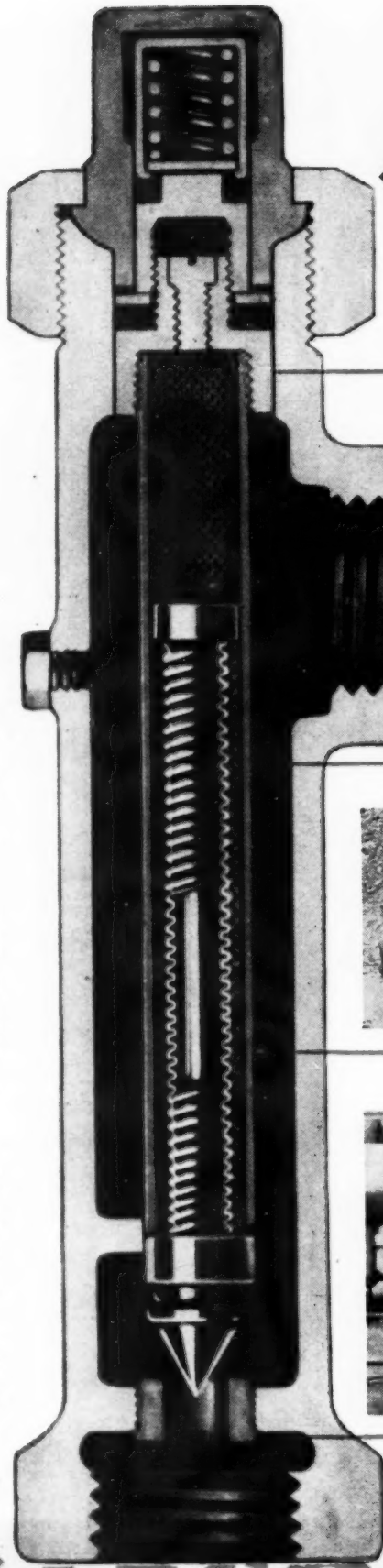
It's a steam trap with a temperature control inside. It serves two functions and costs little more than a trap—and considerably less than most temperature controls.

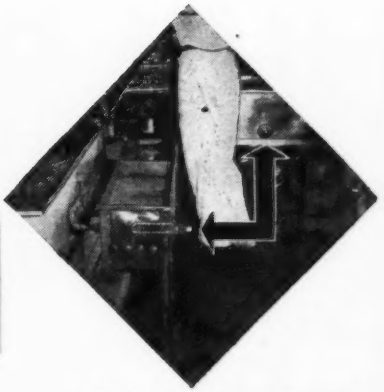
Inserted in a tank, it becomes a steam injector—with approximate temperature control. It is accurate enough for wash tanks, and is used extensively on plating tanks, glue kettles, soap boilers, chocolate dipping and other food and chemical processes.

A TRAP CONTROL OUT OF DOORS

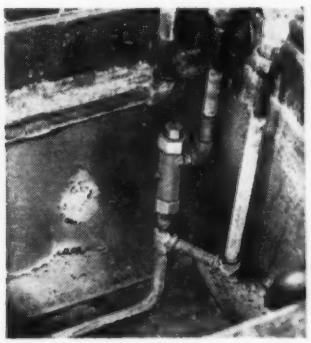
It cannot freeze. It's ideal for out-door tanks, heater lines and heating coils used in fuel, chemical, transportation and other out-door industries.

Several forms of this trap-control are available. Ask for Bulletin Nos. 250 and 550.

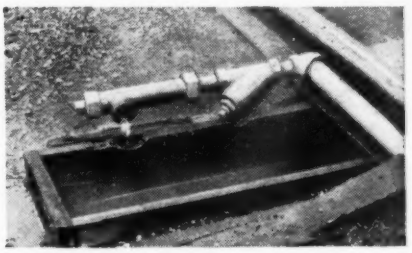




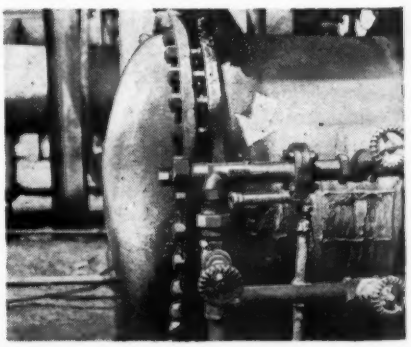
CHOCOLATE DIPPING



PLATING



RAIL HEATING



FUEL OIL HEATER

107

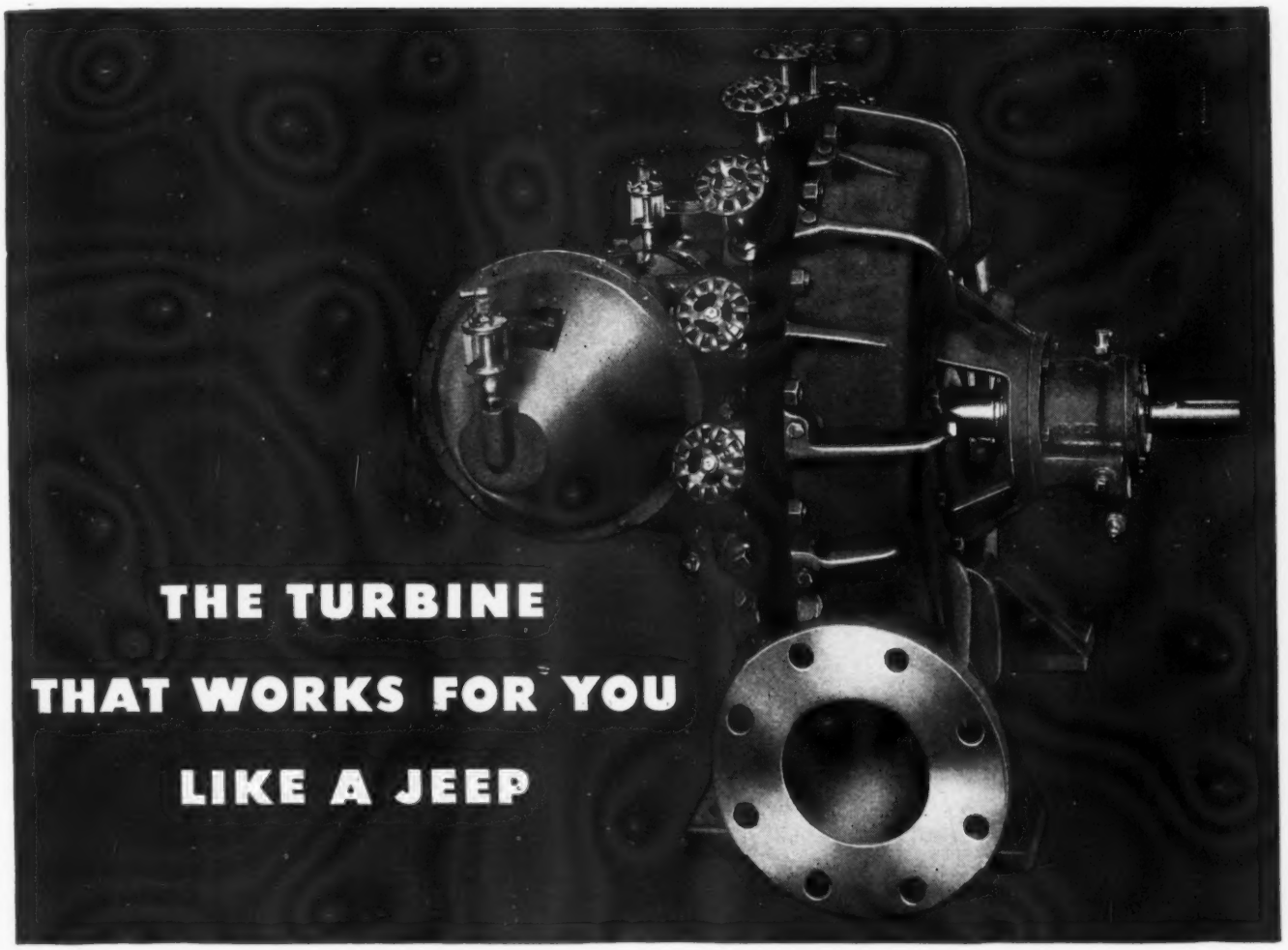
FOUR STARS ON OUR E PENNANT TESTIFY TO SARCO PERFORMANCE IN THE WAR EFFORT

ARMY E NAVY

SARCO SAVES STEAM

Represented in Principal Cities

SARCO COMPANY, INC., 475 FIFTH AVE., NEW YORK 17, N.Y. • Sarco Canada, Ltd., 85 Richmond St., W., Toronto 1, Ont.



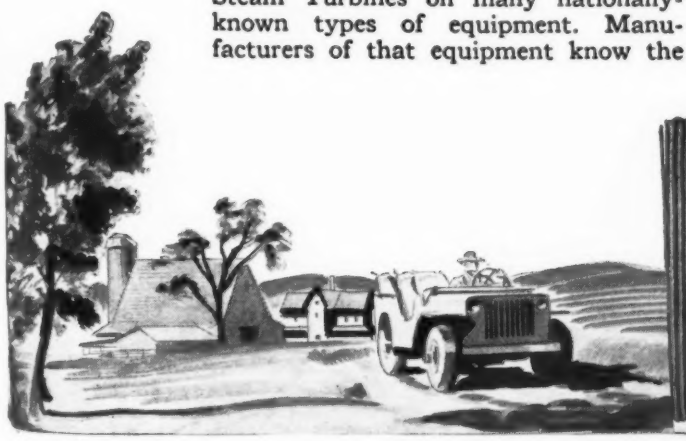
Small, but powerful . . . like a jeep. That's the Coppus Steam Turbine that you see around so many places powering pumps, blowers, fans, stokers and other equipment requiring a steady, sturdy source of small HP.

The Coppus line of "Blue Ribbon" turbines runs from 150 HP down to fractional — there are six frame sizes, and prices are in proportion. You can match a Coppus turbine to the job, saving the money you might otherwise spend for a turbine that's larger than necessary.

You'll see Coppus "Blue Ribbon" Steam Turbines on many nationally-known types of equipment. Manufacturers of that equipment know the quality that is represented by the Coppus "Blue Ribbon" — more than 85% of all orders since 1937 has been repeat business.

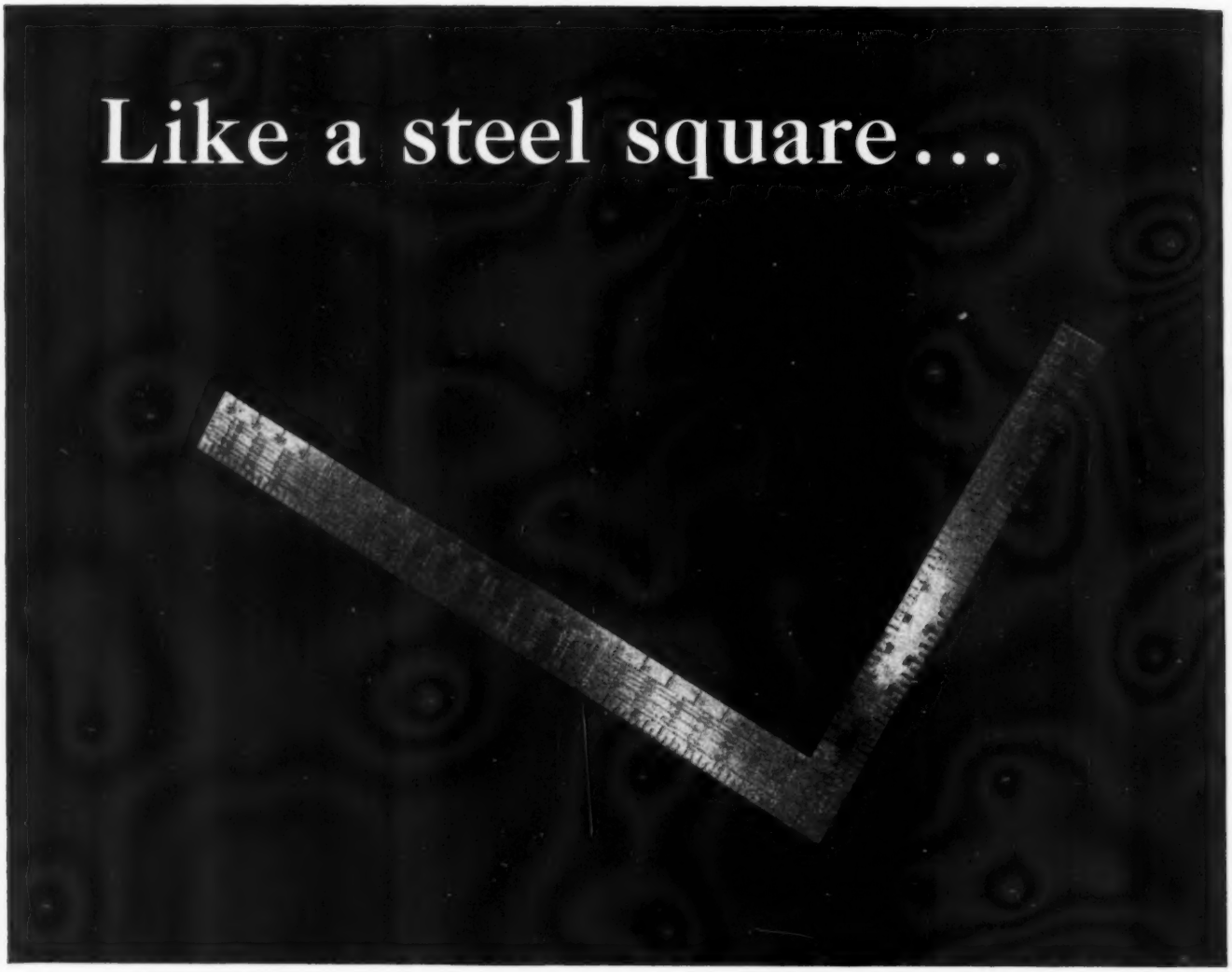
Select the right size of Coppus turbine for any job that calls for "jeep duty". Like all Coppus "Blue Ribbon" products (blowers, ventilators, gas burners, etc.), they are made to extremely close tolerances with accuracy controlled by Johansson size blanks. Before shipment, every turbine is dynamometer-tested.

Write for Bulletin 135–10. Coppus Engineering Corporation, 406 Park Avenue, Worcester 2, Mass. Sales offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" products in SWEET'S.



ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

Like a steel square...



The Royal never needs adjustment

Because there's nothing to adjust

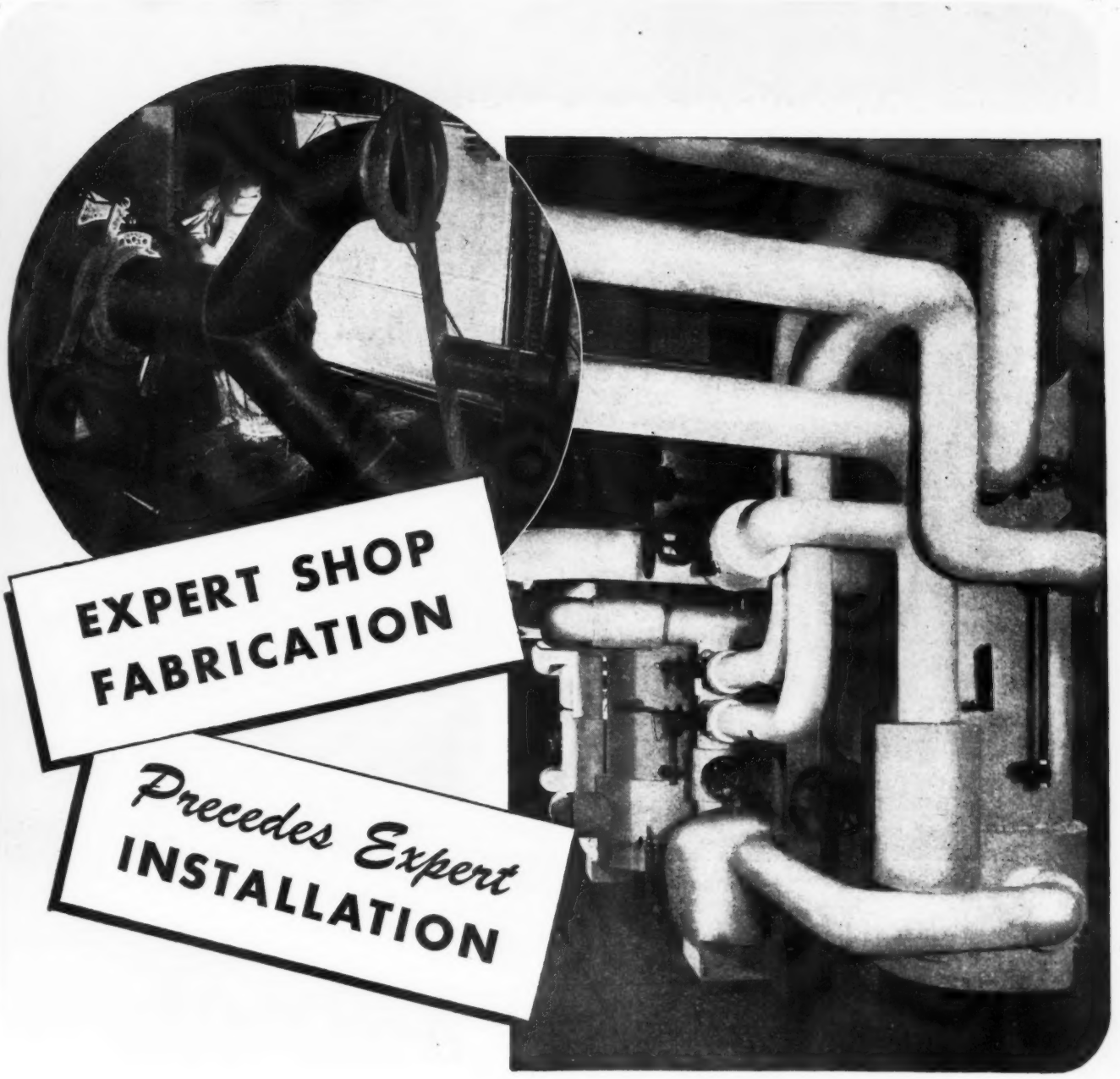
The ROYAL is the *only* Flush Valve which has no adjustment or regulation. Its simplicity of engineering design, *plus* precision manufacture, insure accurate and lasting performance.

More than 4 million ROYAL Flush Valves are in daily service—including thousands of the first ROYALS installed over 36 years ago.

The ROYAL is "standard equipment" with discriminating builders and owners throughout the country. In fact, entire school systems, hotel chains, hospitals, industrial institutions, etc., use ROYALS exclusively.

For the best in Flush Valves specify Sloan—remember, there are more Sloan Flush Valves sold than all other makes combined.

SLOAN VALVE COMPANY
4300 WEST LAKE STREET, CHICAGO 24, ILLINOIS

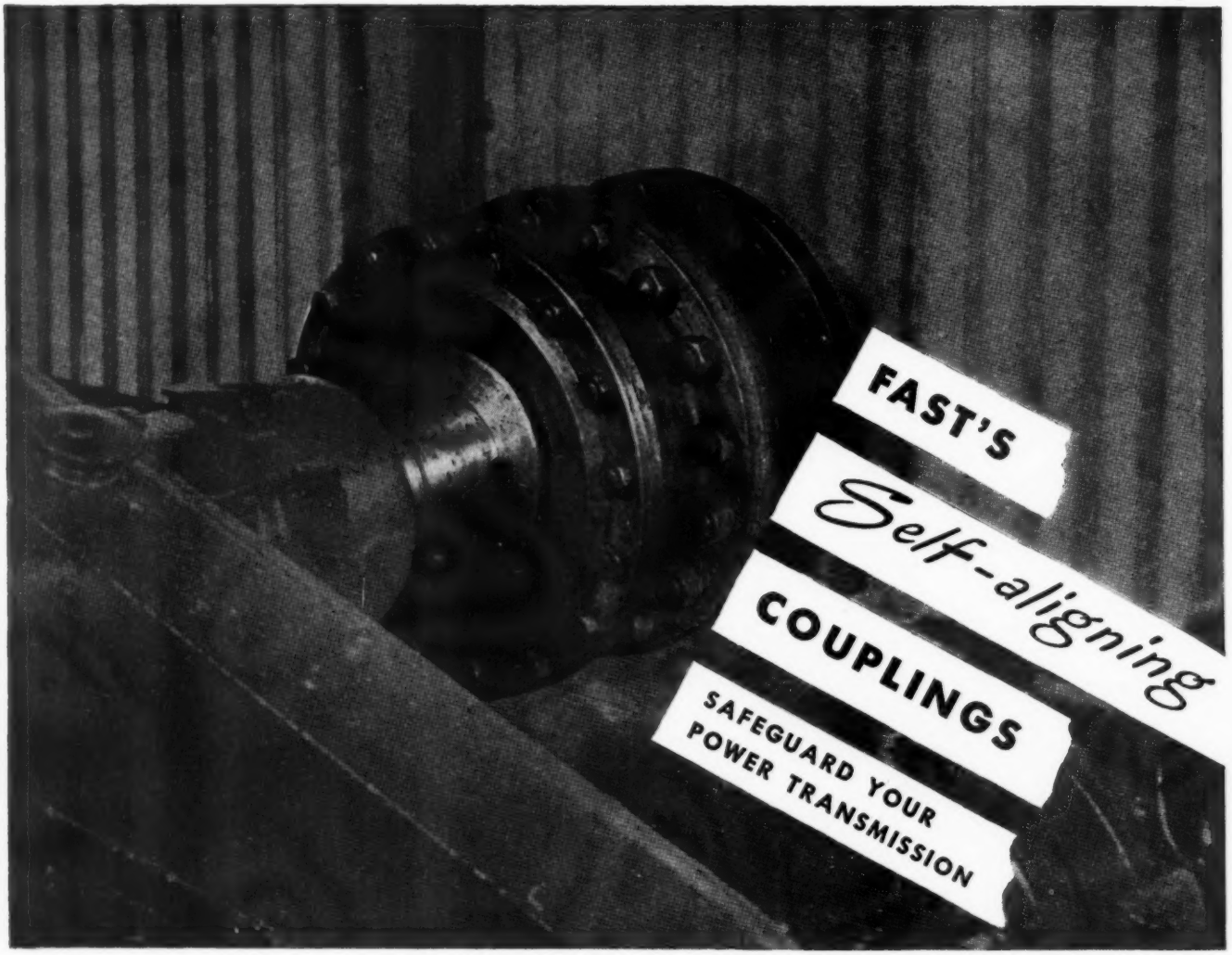


EXPERT shop fabrication of sub-assemblies – as large as shipping facilities permit – makes possible simpler, faster, cheaper erection. These sub-assemblies – produced under ideal conditions and with the aid of equipment not always available in the field – are stress relieved, pressure-tested, checked for dimensional alignment, cleaned and inspected, and are ready to slip into place.

Pre-fabrication is economical and efficient for power piping of every type and material. Our engineers will be glad to discuss with you its applicability to your particular problem.

Pittsburgh Piping
AND EQUIPMENT COMPANY
10 Forty-Third Street — Pittsburgh, Penna.

Woolworth Building, New York
Chamber of Commerce Bldg., Indianapolis
Book Tower, Detroit
525 Market Street, San Francisco
634 S. Gramercy Place, Los Angeles
Peoples Gas Building, Chicago
Public Square Building, Cleveland
10 High Street, Boston
Heights State Bank Bldg., Houston
Whitehead Building, Atlanta



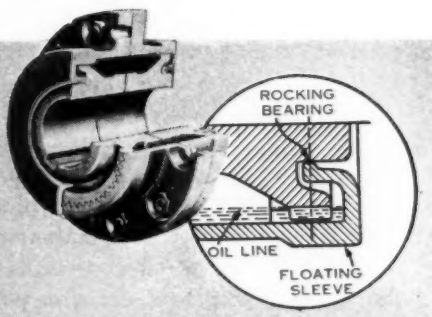
24 hours per day, 258 days out of 365,

FOR 14 TROUBLE-FREE YEARS—AND STILL GOING!

Here's a story with a moral for every engineer who's looking for *dependable* power transmission.

The Fast's Coupling shown is direct connected to a 450 HP, 4 cylinder, 4 cycle, air injection, Diesel Engine and a 6″ x 24″ horizontal, triplex, double acting, reciprocating pump. This equipment was purchased in 1931 and has operated almost continuously with the exception of periodical shut-downs for inspection and maintenance. During the entire 14 years, the coupling has served with no interruptions to service whatever, and with no maintenance expense. This equipment was originally installed in Magnolia Pipe Line Company's Kilgore Station and later moved to their Andrews Station, Texas.

Fast's Couplings have an earned reputation for lasting as long as the connected machines. Their record is the soundest possible guide in specifying couplings for applications where proved dependability is essential. We will be glad to send you a catalog, on request. Bartlett Hayward Division, Koppers Company, Inc., Baltimore 3, Maryland.



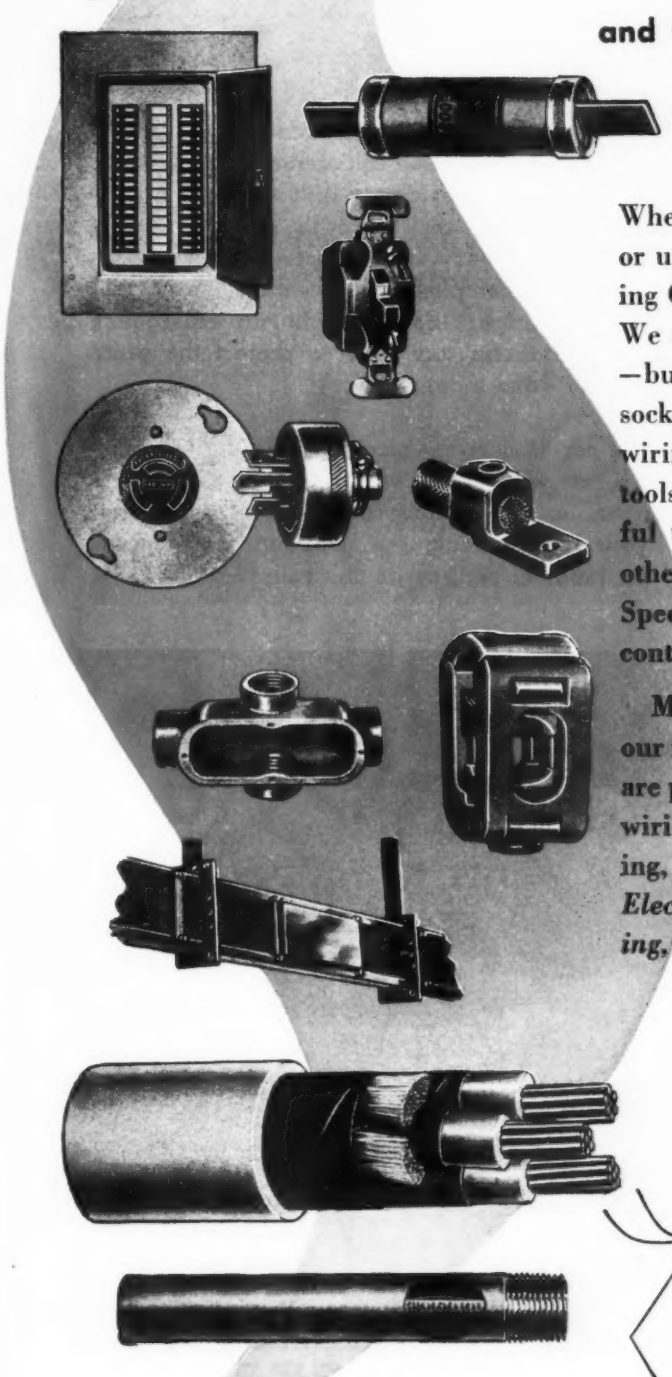
Here you see the features that give Fast's Couplings their remarkable dependability. All parts are protected from wear by a positive film of oil. Oil purity is guarded by rocking bearings, located in the one position where they maintain a positive metal-to-metal seal. There are no perishable parts in "Fast's."

a KOPPERS Product

EVERYTHING FOR . . .

Wiring your plant or product

Graybar distributes wire, cable, wiring supplies and tools . . . offers specialized, local service



Whether the wiring will be indoors or outdoors—aerial or underground—there are excellent reasons for having Graybar provide *everything the job requires:* (1) We distribute carefully-selected makes of wire, cable—busduct, conduit, raceways—connectors, insulators, sockets—switches, panels, fuses—everything else for wiring, including primary equipment and specialized tools. (2) We *know* wiring—all kinds—and are careful to supply items that properly complement each other. (3) Right in your vicinity there's a Graybar Specialist who can capably assist you or your electrical contractor in planning any wiring job.

Many electrical items are quickly available from our near-by warehouse. As currently unavailable items are produced, we'll be ready to meet all your needs for wiring, power apparatus, ventilating equipment, lighting, electric tools, and communication units. *Graybar Electric Company. Executive offices: Graybar Building, New York 17, N. Y.* 4632

IN OVER 90 PRINCIPAL CITIES

Everything Electrical via Graybar

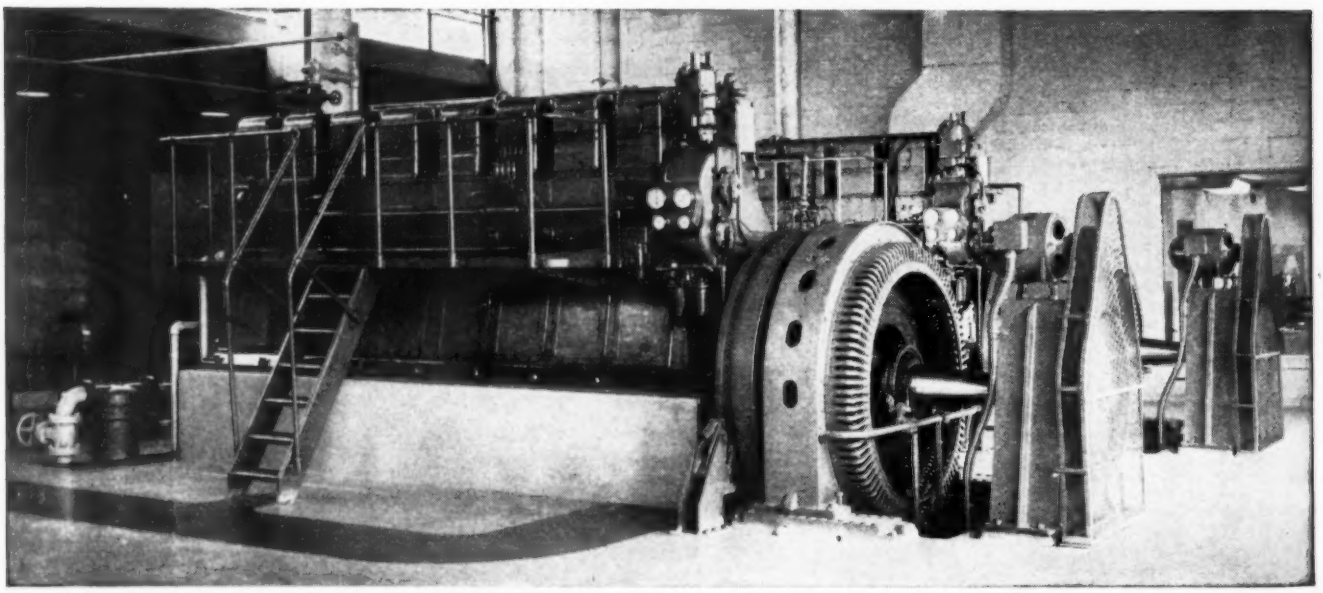
Eight times Around the World Non-Stop!

THE two 8-cylinder Cooper-Bessemer Diesels shown below have been in constant operation for 17,000 hours. Thus piston travel alone, in each of the sixteen cylinders, exceeds the equivalent of a non-stop trip eight times around the earth!

Seems incredible, especially when you consider all the allied engine parts such as rings, liners, bearings, pins and valves. Still there is no evidence whatever that any repair or maintenance is needed — and there never has been! Since standby engines were unobtainable despite greatly increased power demand, such dependability has been welcome, indeed.

This case history is not intended to discourage planned or pre-timed maintenance, but it does provide further evidence that exceptional stamina, unusual resistance to wear, and prolonged efficiency are Cooper-Bessemer engineering accomplishments — advantages that are downright life-savers in an emergency . . . certain in any case to protect the profit side of your ledger.

Cooper-Bessemer welcomes the chance to cooperate with you or with your consulting engineers in determining the correct engines for your requirements . . . stationary or mobile, on land, at sea, or on the rails.



These two Cooper-Bessemer engines, Type JS 8-cylinder 600 hp diesels, are installed in the R.E.A. Tri-County Electric Cooperative at Portland, Michigan. Under the supervision of Mr. S. Don King, Superintendent, they have piled up 17,000 continuous operating hours without repair and with no indication that any maintenance whatever is needed.

THE **Cooper-Bessemer** CORPORATION

Mt. Vernon, Ohio • Grove City, Pa.

NEW YORK WASHINGTON HOUSTON DALLAS TULSA SHREVEPORT LOS ANGELES ST. LOUIS SEATTLE

DESIGNED FOR LONG SERVICE AND DEPENDABILITY

...BWH CONVEYOR BELTS!

Increased postwar demand for construction materials, coal, and ores will require heavier tonnages than ever before . . . which means heavier strains on mining equipment and especially on conveyor belts.

That's why it will pay you to install a BWH Conveyor Belt. Tough, rugged, dependable, built to stand up day-in and day-out under grueling punishment, BWH will cut maintenance time and costs. Made by the famous ROTOCURE process of continuous vulcanization—which eliminates trouble spots and increases operating life—BWH Belts have created records for durability. So when you want a conveyor belt that can *take it,* look to BWH for dependable ruggedness . . . BWH distributors for dependable service!

HAVE YOU A JOB WHERE STAMINA COUNTS?

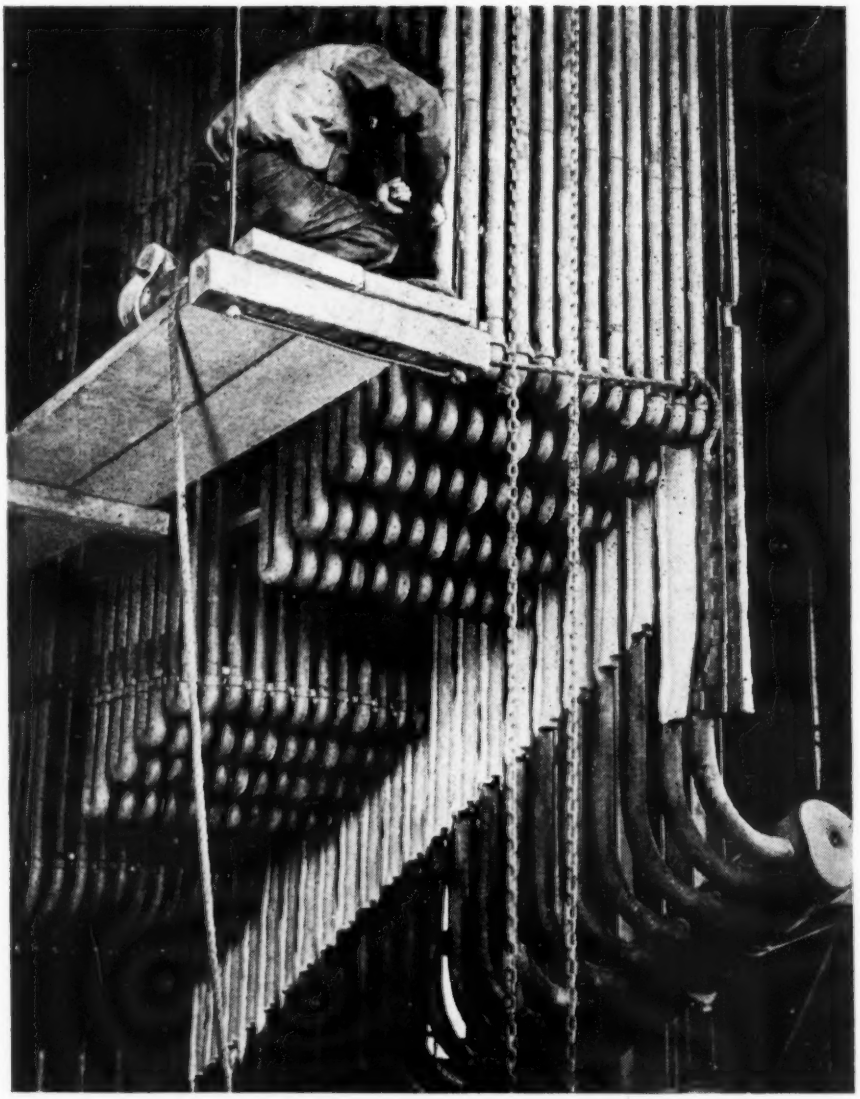
Bring us your toughest problems . . . we're specialists in solving them. Consult your nearest BWH distributor, or write to BWH direct.

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in All Principal Cities

WORKS: CAMBRIDGE, MASS., U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

TUBES that are worth MILLIONS



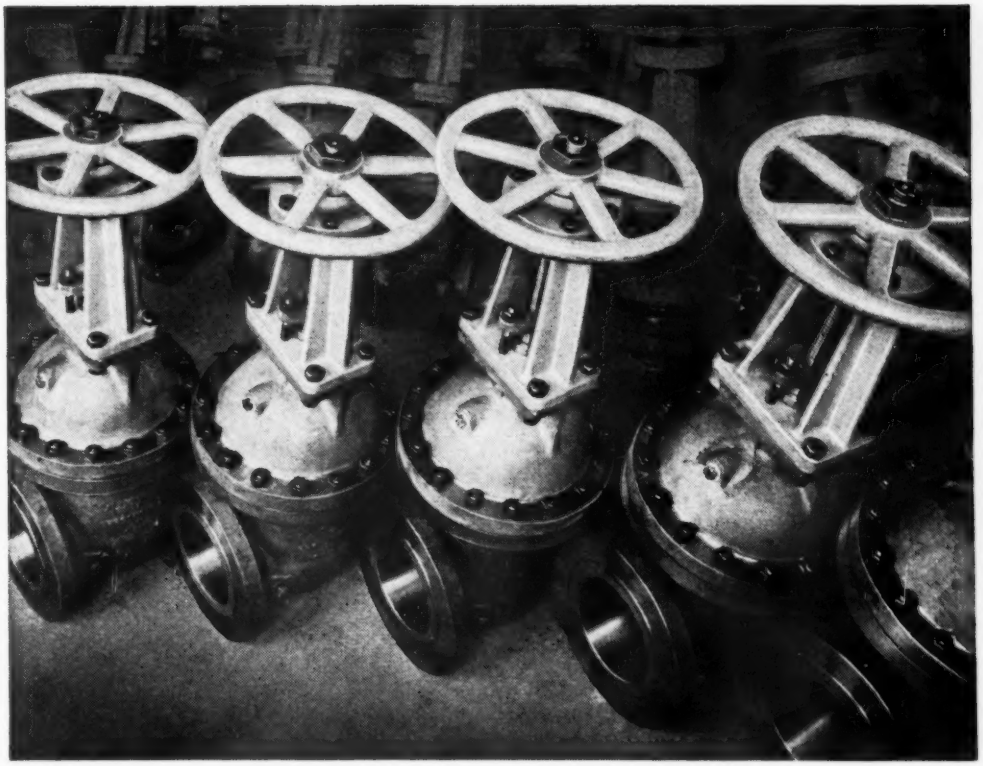
At stake in every foot of B&W boiler tubing is the 64-year reputation for dependable performance earned by millions of dollars worth of B&W industrial, central station and marine boilers.

No one could be more directly concerned with a boiler's *performance* than the boiler *maker*—and a boiler is no better than its tubes. No one, therefore, has a stronger incentive than B&W to produce the best possible boiler tubes . . . because *no* other tube manufacturer is an integral part of an organization that also builds boilers. Every time you buy B&W tubes for *any* steam generating or heat transfer equipment, you get the same high quality, safety, dimensional accuracy and easy workability insisted upon in B&W tubes for all new B&W-built boilers. Besides, you get tubes matched to your specific service conditions without prejudice toward any type or materials because B&W makes BOTH SEAMLESS and WELDED TUBES—all to *one* high standard—for every power plant requirement.

B&W

Water-Tube Boilers, for Stationary Power Plants, for Marine Service . . . Water-Cooled Furnaces . . . Superheaters . . . Economizers . . Air Heaters . . . Pulverized-Coal Equipment . . . Chain-Grate Stokers . . . Oil, Gas and Multifuel Burners . . . Seamless and Welded Tubes and Pipe . . . Refractories . . . Process Equipment.

BABCOCK & WILCOX
SEAMLESS & WELDED TUBES
THE BABCOCK & WILCOX TUBE COMPANY
WELDED TUBE DIVISION, ALLIANCE, OHIO — SEAMLESS TUBE DIVISION, BEAVER FALLS, PA.



RESISTS ACID MINE WATERS

Stainless steel assures dependable service

These large valves, which are to be used for regulating the flow of acid mine waters, are made of stainless steel to resist corrosion. For their "tough jobs," many industries specify that valves be made of stainless steel because the resistance of the metal to wear and corrosion assures long and dependable service.

If you are interested in uses of stainless and other alloy steels, ask to receive our monthly publication, ELECTROMET REVIEW. If you need information on the production, properties, or fabrication of these steels, write our Technical Service Department. We do not make steel, but we do produce the ferro-alloys which are used in its manufacture, and our engineers have accumulated a fund of information on the use of stainless steel in many industries.

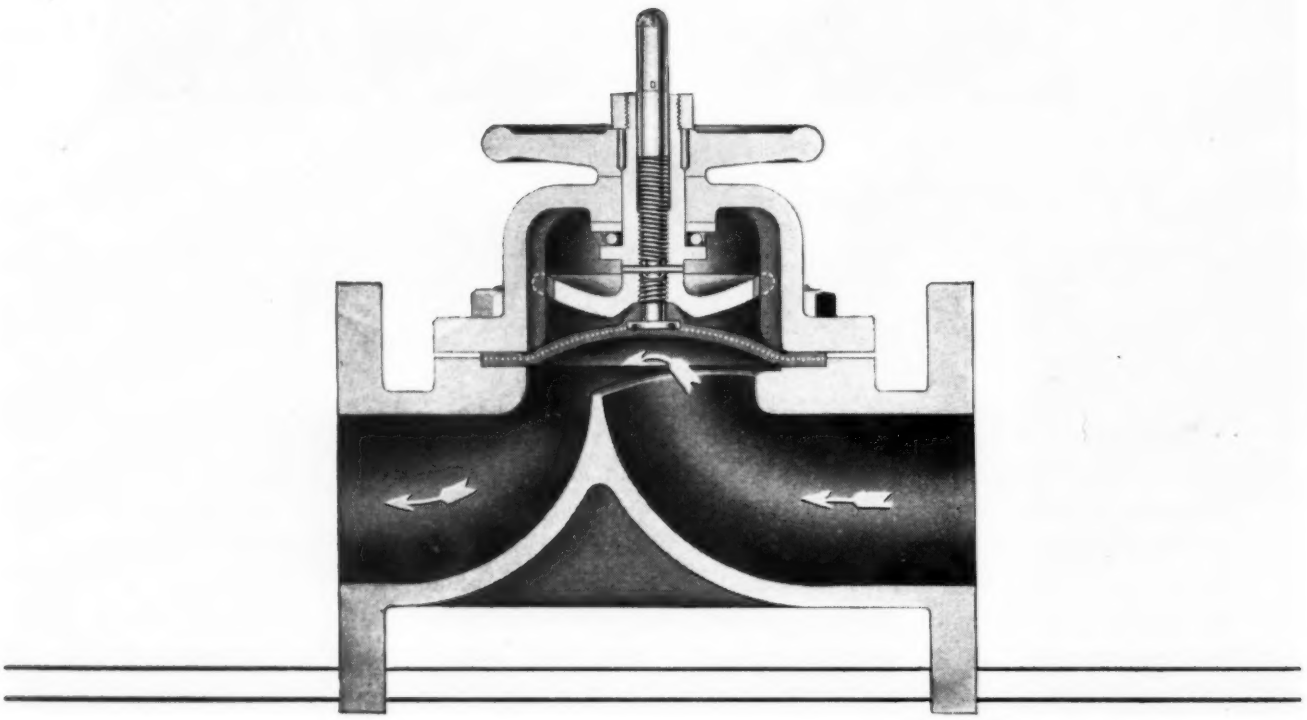
ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

STAINLESS STEEL

BEAUTIFUL ENDURING STRONG TOUGH

NOW...A VALVE THAT LAUGHS AT CORROSIVES AND ABRASIVES

...and cannot LEAK, "FREEZE" or JAM!



McAlear No. M-1455 Diaphragm Valve

★ *Pressures, Vacuum to 150 lbs.* ★ *Temperatures to 150° F.* ★ *Sizes ½" to 6".*

- Applicable for air and water lines and special services.
- Used in *every* industry that handles corrosive or abrasive fluids.
- Diaphragm separates mechanism *completely* from fluids handled.
- Shut-off positive—even with solids trapped on seat.
- Closure not dependent on metal-to-metal contact.
- Cannot leak in any position.
- Requires no re-packing.
- Requires no re-seating.
- Diaphragm replaceable with valve in line.
- Special pressure operated types for automatic or pilot control.

FOR BULLETIN giving complete data, write McAlear Manufacturing Company, Automatic Control Division of Climax Industries, 1913 S. Western Ave., Chicago 8, Illinois.

CLIMAX INDUSTRIES

McALEAR

PRESSURE FLOW LIQUID LEVEL TEMPERATURE

controls

for STEAM, WATER, AIR, OIL—GAS

For Real Belt Savings . . . Buy the Belt on the *REEL!*

"Packaged" Veelos On Reels Saves Money . . . Time . . . Space

Nothing causes more time-loss and confusion in the stockroom than a hodge-podge of V-belts in assorted sizes. Switch to Veelos—the link V-belt that's "*packaged*" *on plywood reels*—and replace chaos with order. A handy reel—holding 100 feet of belt—is stored in minimum space . . . *any* length V-belt for any size drive is quickly uncoupled . . . money that would be tied up in a large spare stock is saved . . . belt waste due to deterioration is eliminated because of more efficient, economical turnover when all lengths are uncoupled from a single reel—*right at the machine* . . . long work stoppages are ended by the ease and speed with which any required length of Veelos can be coupled on the drive.

The combination of Veelos link construction and the packaging of Veelos on reels has brought V-belt up-to-date . . . provides important advantages to users. The details are worth knowing—write today for full information.

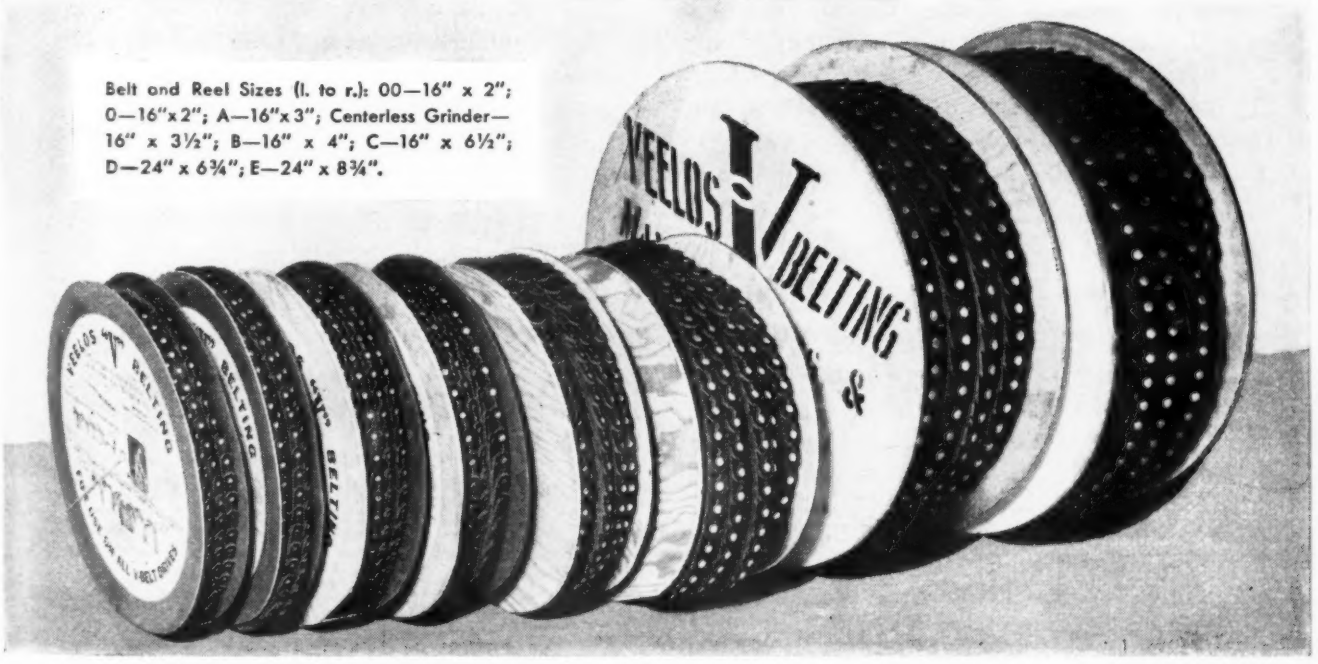
MANHEIM MANUFACTURING & BELTING CO.
546 MANBEL ST., MANHEIM, PA.

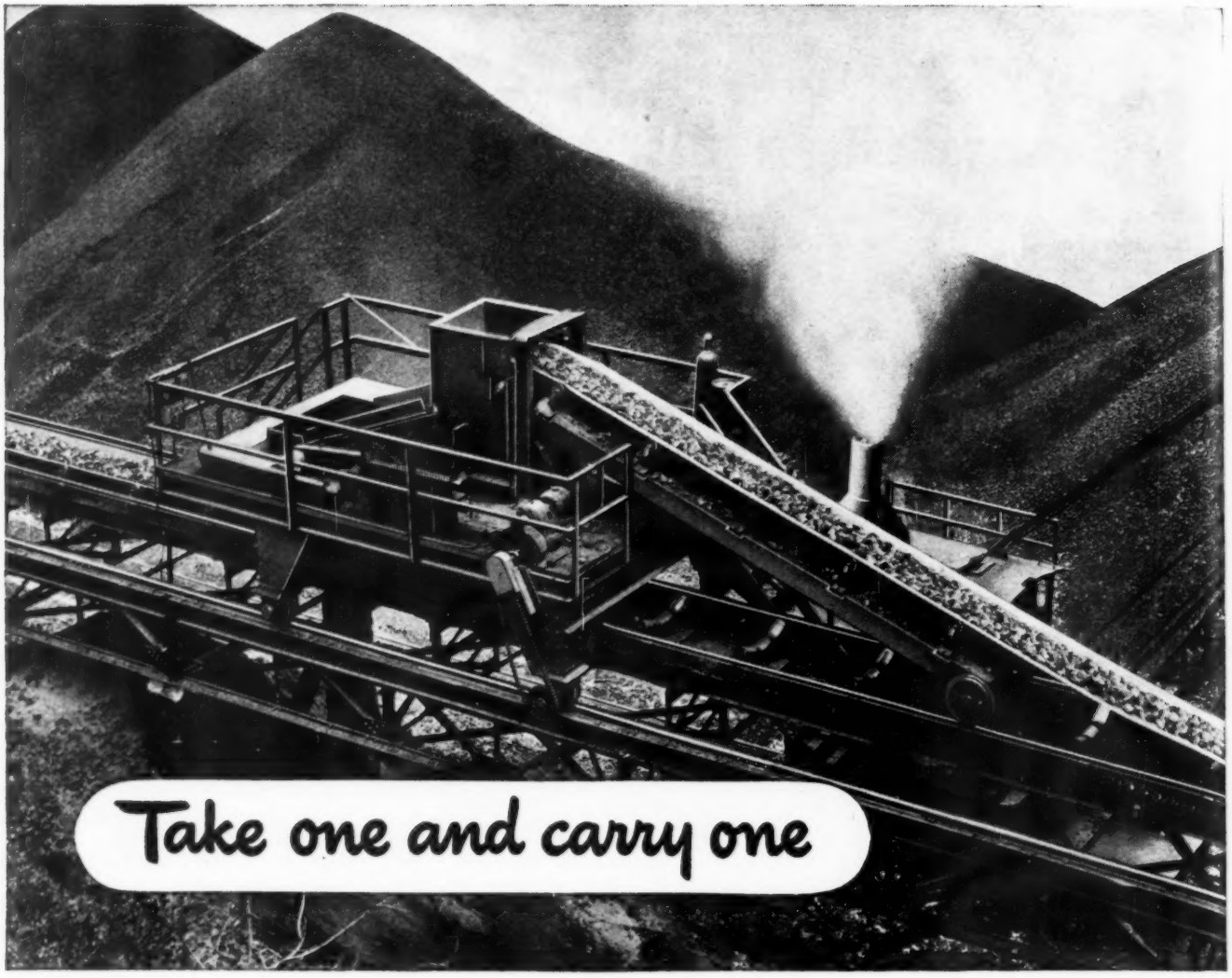
LINK CONSTRUCTION
UPS PRODUCTION

VEELOS
THE LINK
V-BELT

Adjustable to any Length
Adaptable to any Drive

Belt and Reel Sizes (l. to r.): 00—16" x 2"; 0—16"x2"; A—16"x3"; Centerless Grinder—16" x 3½"; B—16" x 4"; C—16" x 6½"; D—24" x 6¾"; E—24" x 8¾".





One size or many sizes —Whatever your requirement, you can size coke, coal, or other materials right on the conveyor.

Because every Robins Vibrex Screen is "Job-Engineered," it can be mounted anywhere . . . even in movable trippers . . . without fear of harmful vibration that may shorten the life of tripper or conveyor.

You can save time, money, and labor by sizing solid fuels in exactly the sizes you will require as you stock-pile them. By simply adding screens and trippers, you can prepare as many sizes as are desirable with minimum degradation and waste.

This is just one example of how Robins "Job-Engineering" adds to the efficiency of bulk materials handling.

While your problem is still fresh in your mind, why not take full advantage of the experience and knowledge of a Robins "Job-Engineer." A note or call will bring him to your desk—without obligation or cost.

AMERICA'S ONLY *COMPLETE* MATERIALS HANDLING SERVICE

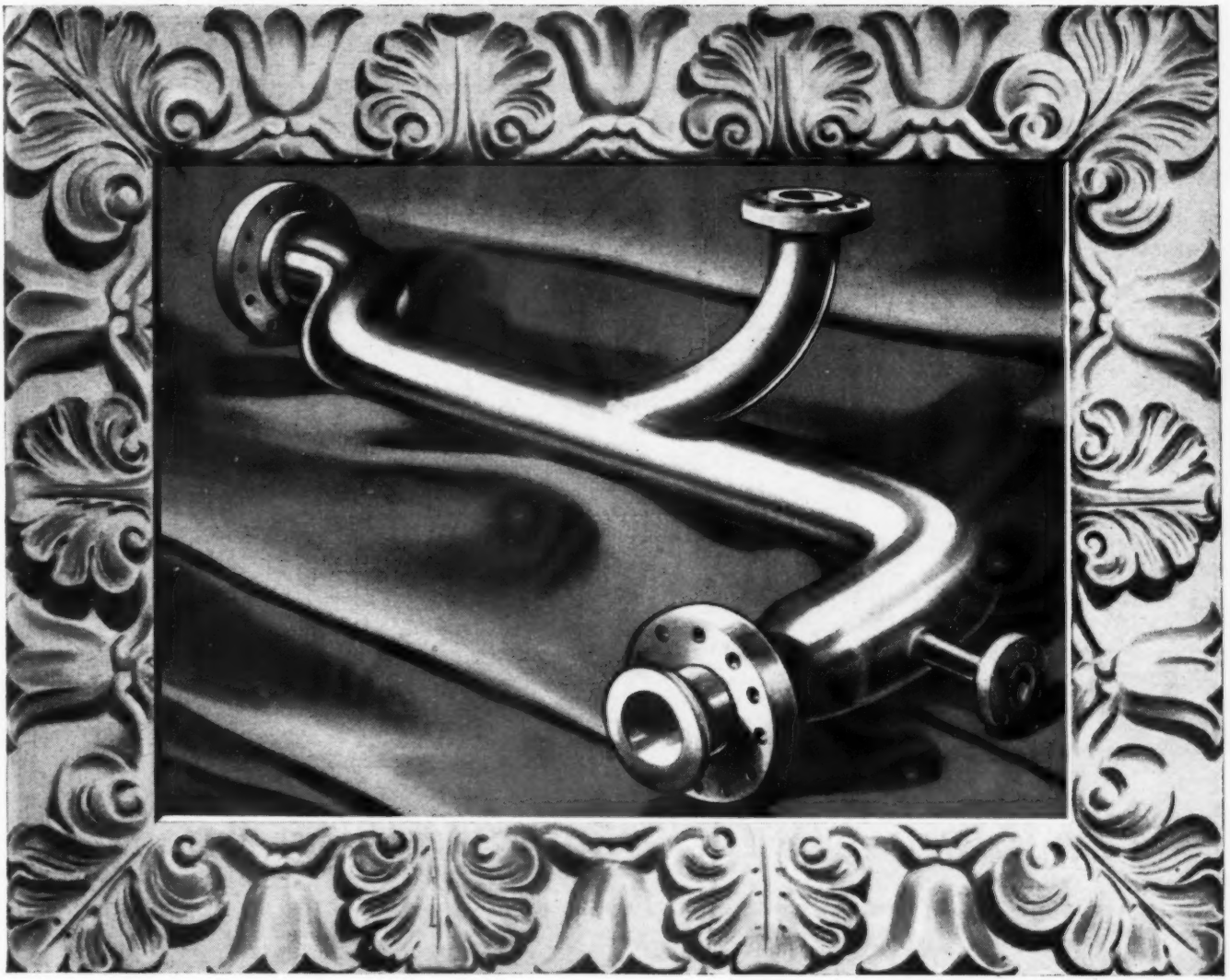
Hewitt and Robins unite to offer you 136 years of combined experience in "Job-Engineered" rubber products and machinery designed to answer any materials handling problem you may have.

ROBINS

CONVEYORS INCORPORATED

PASSAIC, NEW JERSEY

DIVISION OF HEWITT RUBBER CORPORATION



Pipe Pre-Fabrication is a Fine Art

Modern pipe fabrication is much more than the routine combining of bends, fittings, flanges, welds, etc. It is a fine art requiring a high degree of skill and judgment on the part of many specialists—skill and judgment which come only from long experience.

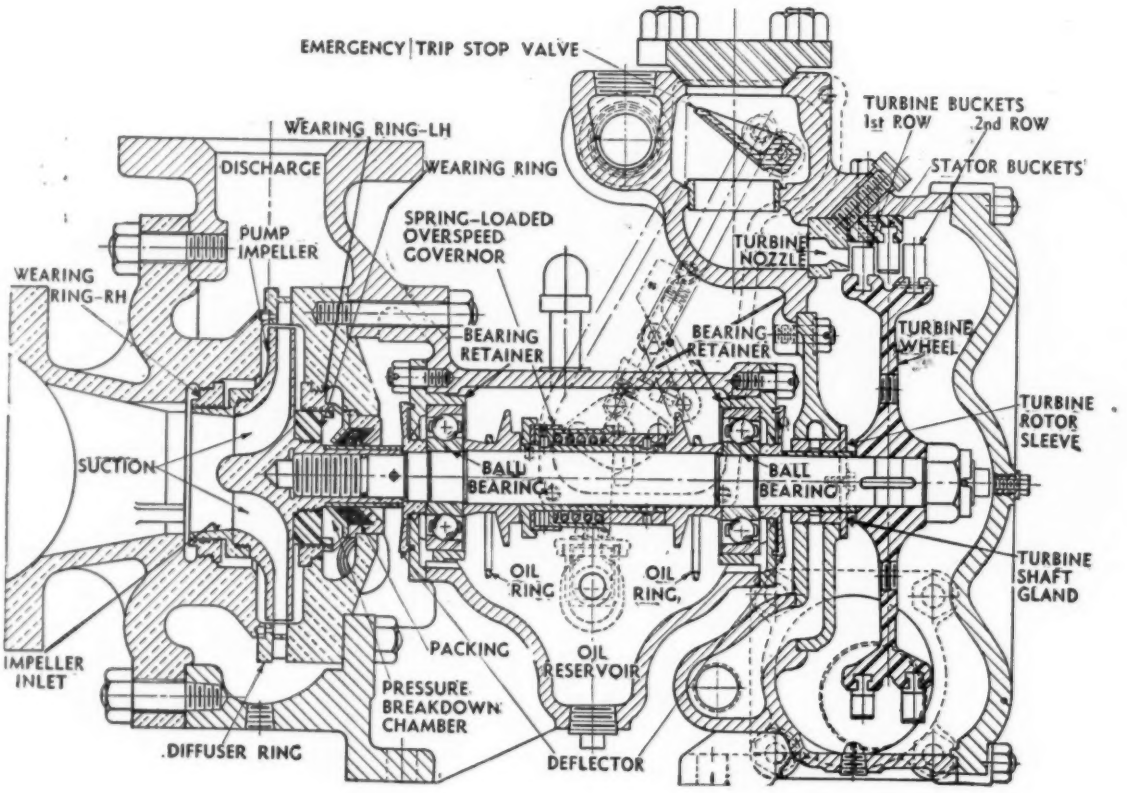
Engineers must know how to get the desired result in the most economical way—must be able to plan sub-assemblies which are practical and reduce field work to a minimum. Pipe benders must be masters of a difficult art: bending without flattening or wall thinning or metal deterioration. Pressure piping welders must be qualified on different materials and on various procedures. Men who do aligning, heat treating, testing, etc. must all have their special qualifications.

Qualified pipe fabricators have the advantage of permanent organizations containing men who have these qualifications. As a result, piping pre-fabricated by a qualified fabricator is better in quality, easier to erect and insures fulfillment of all intents of the design.

THE PIPE FABRICATION INSTITUTE

Devoted to the Technical and Economic Problems in Piping

1108 CLARK BUILDING, PITTSBURGH, PA.



The Pump The Industry Is Talking About!

THE COFFIN TURBO PUMP

FOR BOILER FEED SERVICE

ONLY ONE UNIT—Centrifugal Pump, Steam Turbine

Capacities To	*Pressures To*
350 G. P. M.	*500 P. S. I.*

Saves Space, Weight and Steam

—Send For Descriptive Bulletin—

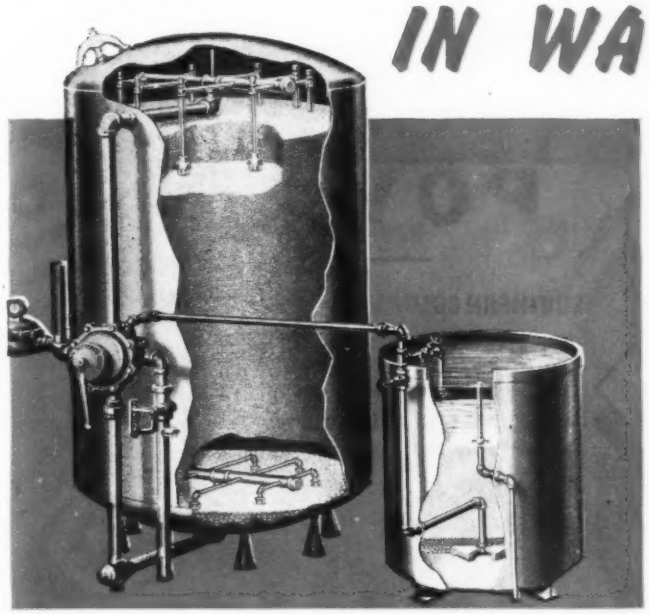
THE J. S. COFFIN, JR., COMPANY

326 SOUTH DEAN STREET, ENGLEWOOD, NEW JERSEY

REPRESENTATIVES

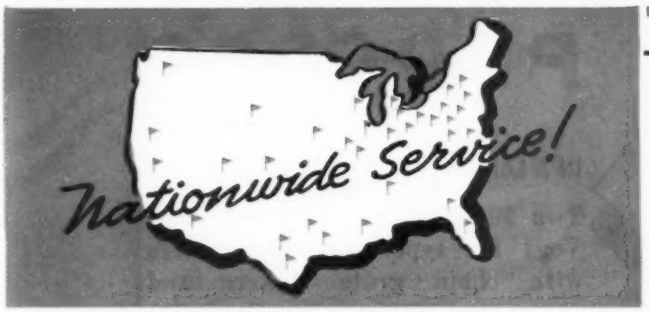
MOBILE, ALA.	MARINE SPECIALTY CO.	*8 South Water Street*
NEW ORLEANS, LA.	P. THOMPSON TOOL & SUPPLY CO.	*200 Tchoupitoulas Street*
NEW YORK	JAMES R. COE	*Room 2400, 220 W. 42nd Street*
PHILADELPHIA, Pa.	MALESON COMPANY	*970 Drexel Building*
PROVIDENCE, RI.	ARTHUR P. SISSON	*P.O. Box 55, Edgewater Station*
PORTLAND, ORE.	JOHN H. MARVIN CO.	*1213 N.W. Hoyt Street*
SEATTLE, WASH.	JOHN H. MARVIN CO.	*1016 First Ave. South*

WHO OFFERS MOST IN WATER SOFTENING?



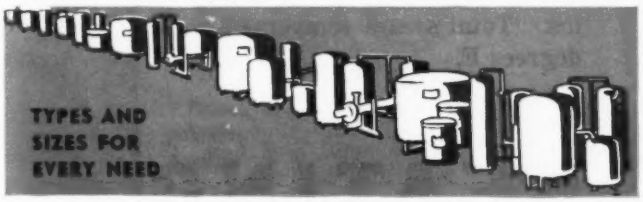
First consider these unmatched features of the Elgin Water Softener . . . . .

1. **Delivers up to 44% More Soft Water**—than other zeolite softeners of the same size.
2. **Lower first cost**—on basis of cost per thousand gallons delivered.
3. **Lower operating cost**—as a result of reduced salt and wash water consumption achieved by improved distributing and collecting arrangement.
4. **Higher efficiency**—because zeolite is kept clean and active, producing more zero-soft water per pound of salt used.
5. **Less Maintenance**—proved by surveys showing fewer repairs, less replacements, and prevention of zeolite loss.
6. **Longer life**—a result of more efficient distribution, collection and regulation of water and brine which keeps zeolite clean and adds years to service life.
7. **Less space required**—other softeners must be as much as 50% larger to give equal capacity.



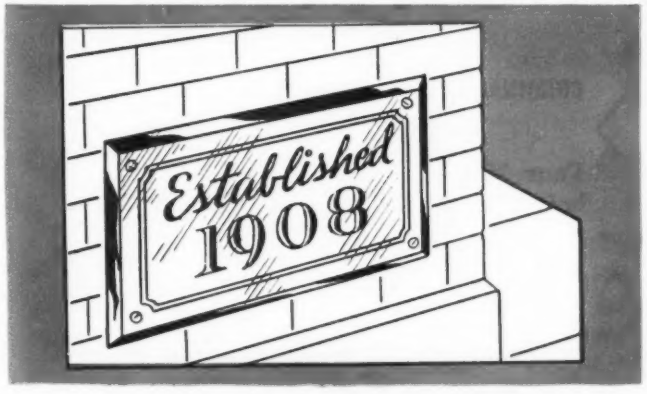
—then consider Elgin nation wide service

In the opinion of hundreds of users, the features of the Elgin Zeolite Softener listed above make it the most effective equipment of this type ever developed. However, no single piece of equipment offers a solution to all water conditioning needs. Therefore, Elgin engineering service is as important as Elgin equipment. Elgin district engineers are located in principal cities from coast to coast. They are specialists with practical operating experience who will assist you in providing economical water conditioning engineered to your particular requirements.



—and the scope of Elgin equipment

With water softeners of every type and size from which to choose, Elgin is in a position to provide equipment specifically designed to your needs. Incredible though it may seem, Elgin is in a position to build over 5,000 combinations of types and sizes of water conditioning equipment.



—Above all, Elgin Experience . . . . .

At your service is knowledge gained in over 38 years of research and engineering experience in which Elgin has pioneered major improvements in the science of water softening and conditioning. In our research department alone, a large staff of engineers and chemists devote their entire time to the solution of special water problems. They maintain one of the country's most complete files of water analyses. Any new analytical work required in making recommendations is performed without charge.

Yes, from any standpoint — product, engineering service, experience — Elgin is the choice of leaders in every field.

NEW BULLETIN 607 gives all the facts. Ask for it.

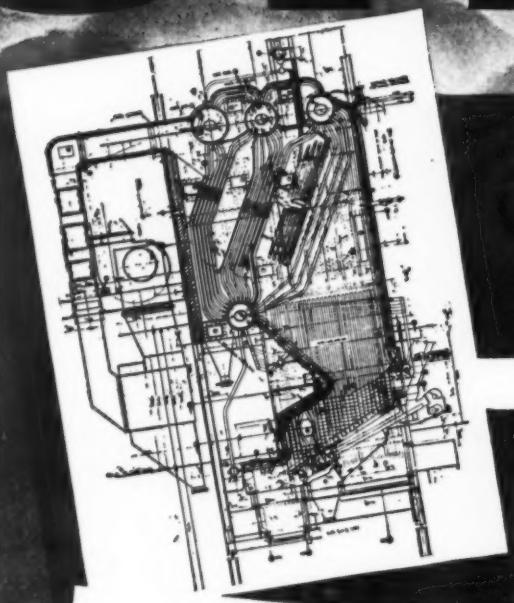
Let an Elgin Engineer Help You Plan

ELGIN SOFTENER CORPORATION

120 NORTH GROVE AVE., ELGIN, ILLINOIS

SOFTENERS ★ FILTERS ★ WATER TREATMENT ★ BOILER WATER CONDITIONING

STEAM *for*

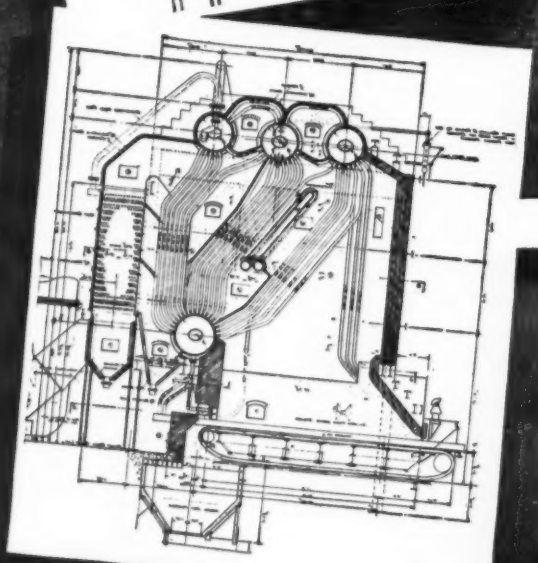


POWER

SOUTHERN COLORADO POWER COMPANY
Pueblo, Colo.

90,000 lbs. steam per hour Vogt LE type bent tube boiler with underfeed stoker. Water walls and economizer. Design pressure 525 lbs. Total steam temperature 750 degrees F.

•

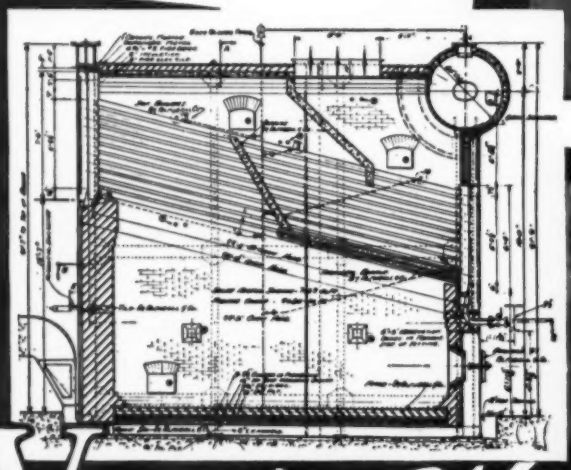


PROCESS

IN A LARGE MID-WESTERN STEEL MILL

Two 105,000 lbs. steam per hour Vogt LE type bent tube boilers with chain grate stokers and economizers. Design pressure 225 lbs. Total steam temperature 550 degrees F.

•



HEATING

CRIMINAL COURTS BUILDING AND JAIL
New York City

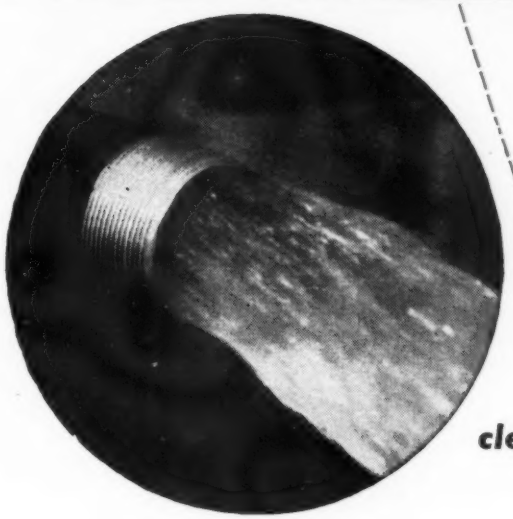
Four Vogt sectional header type boilers of 47,000 lbs. steam per hour capacity, oil fired. Design pressure 200 lbs.

HENRY VOGT MACHINE CO.
LOUISVILLE, KENTUCKY
Branch Offices: NEW YORK, CLEVELAND, CHICAGO, PHILADELPHIA

Vogt *Water Tube* BOILERS

BENT TUBE AND SECTIONAL HEADER TYPES

DOWELL



for more water - faster!

clean your water lines—the chemical way

The Dowell method of chemically dissolving accumulated scale is the modern, rapid method of cleaning important water lines . . . under ground, above ground—indoors or out! Leading railroads, utilities and other industries have found it practical, reliable and economical.

Dowell specialists do the entire job—in a few hours. They chemically analyze samples of deposits taken from *your* lines, select the proper solvents—and bring with them all equipment needed to perform the thorough cleaning treatment.

Call the nearest Dowell office for a free estimate. Ask for your copy of "More Power to America's Industry"—new color booklet which describes the Dowell Chemical Service in more detail.

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Subsidiary of The Dow Chemical Company

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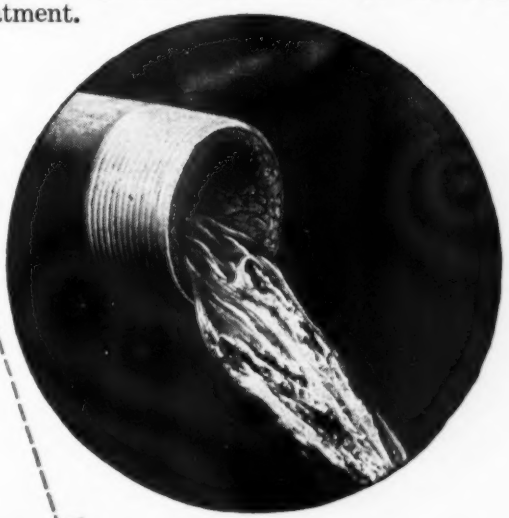
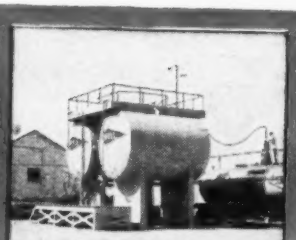
Chicago • Detroit • St. Louis • Houston • Kansas City • Wichita
Mt. Pleasant, Michigan • Salem, Illinois
Long Beach, Casper: Dowell Affiliate—International Cementers, Inc.



SPECIALISTS IN CHEMICAL CLEANING SERVICE

Dowell's experienced industrial engineers are backed by the complete research and technical facilities of The Dow Chemical Company.

Dowell's equipment is modern and complete—scientifically designed. Treating stations and chemical warehouses conveniently located.



Dowell cleaning solvents are "tailor-made" to fit each job. All ingredients are of the highest quality, chosen for best results in your plant.

DOWELL

FOR INDUSTRIAL CHEMICAL SERVICE

ASBESTOS IN ACTION

Structural materials that always stay young...

K&M *"Century"* FLAT ASBESTOS-CEMENT SHEET MATERIALS

Design and construction by the Austin Company

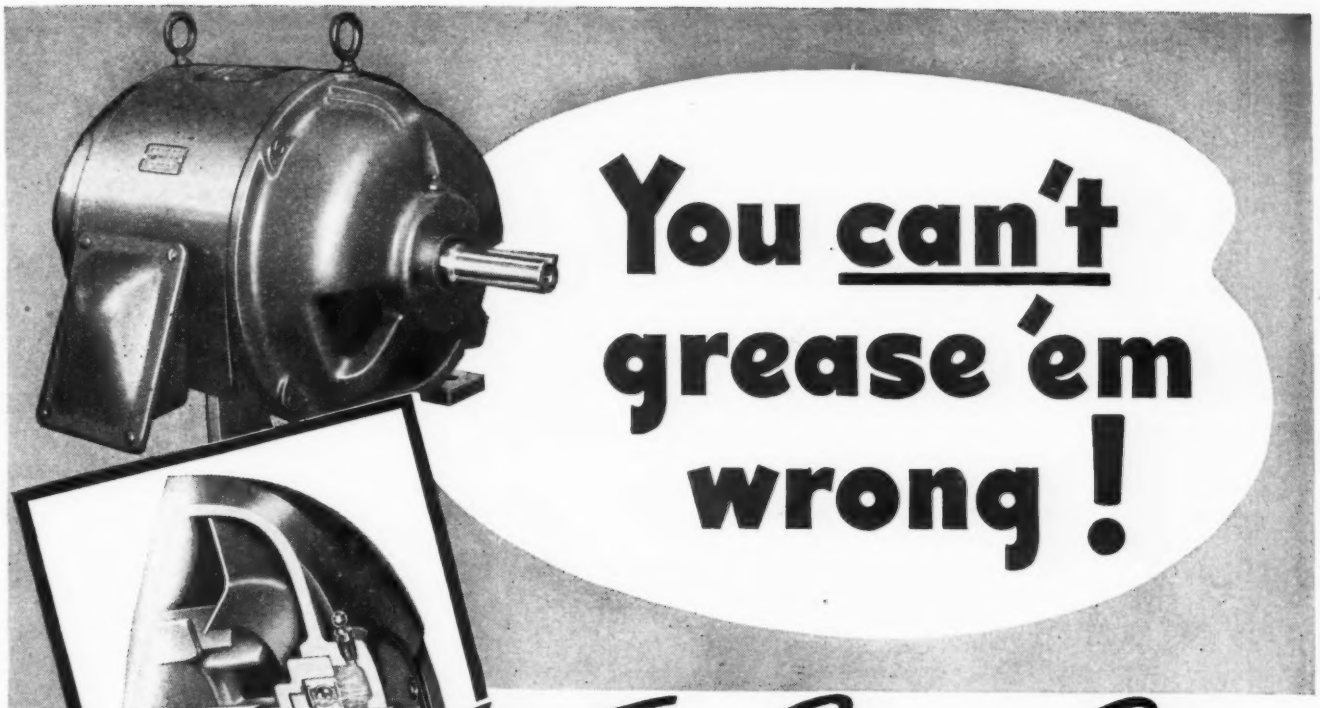
• For rugged strength and staying-power, K&M "Century" Flat Asbestos-Cement Sheet materials are unbeatable. K&M Standard Asbestos Lumber and K&M Monobestos are two such products that grow *tougher* with age, never need maintenance, and practically last forever.

The most recent addition to the "Century" Flat Asbestos Sheet family is K&M "Century" APAC—a sturdy, light-weight material that's highly resistant to the common enemies of most building materials. Fire, rodents, termites, weather, rot . . . APAC withstands them all, and seems to stay eternally young. Its 4′ x 8′ sheets are ideal for many types of industrial construction, such as walls, partitions, ceilings, elevator shaft linings—in fact APAC has as many uses as a building has surfaces.

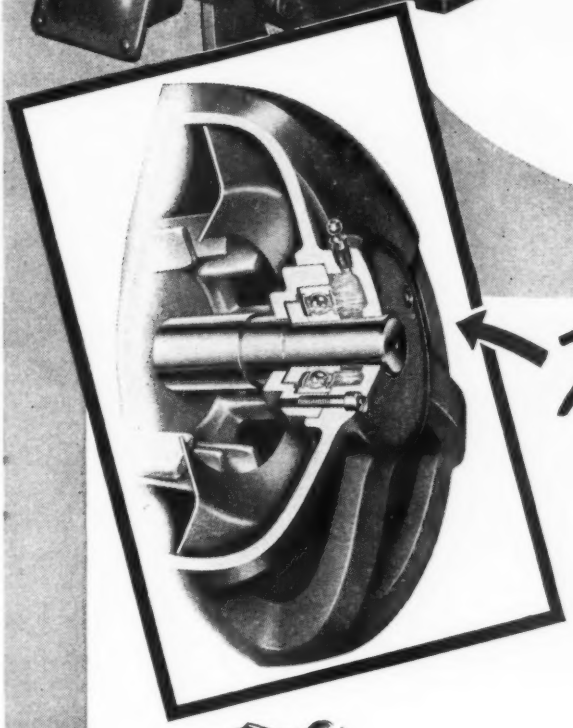
K&M "Century" Flat Asbestos Sheet Materials hold the right answer to many construction problems. Write to us for full information on what they can do for YOU.

Nature Made Asbestos...
Keasbey & Mattison has been making it serve mankind since 1873

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA



You can't grease 'em wrong!



This Bearing Design

PROTECTS

RELIANCE *Series C* MOTORS

INDEFINITELY!

OVERGREASE . . . UNDERGREASE . . . FAIL TO GREASE

IT MAKES NO DIFFERENCE!

Write today for Bulletin C-118 which gives complete details on the many additional advantages of Reliance Series C Motors.

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RELIANCE A-C D-C MOTORS

POWER

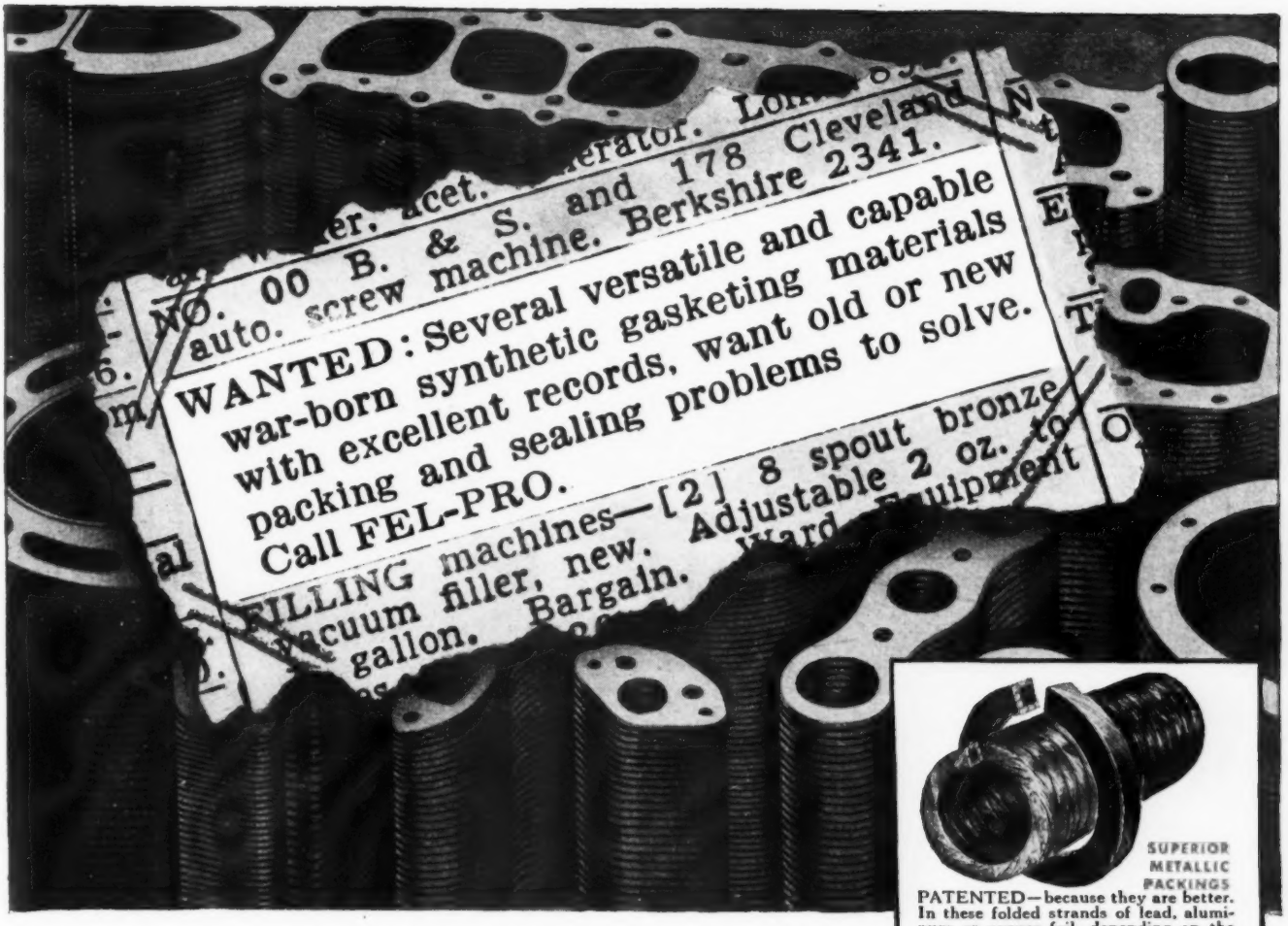
EXIDES HAVE THE CRANKING POWER THAT DIESEL STARTING DEMANDS

Exide Batteries are designed specifically for Diesel engine cranking. And their development through the years has steadily kept pace with Diesel engine improvements. Exides have the extra power and ruggedness which this exacting task requires. And regardless of where or how often they are used, you can always count on Exides for dependability, long-life and ease of maintenance.

Exide
BATTERIES

Write today for a FREE copy of the Exide Catalog on Heavy-Duty Batteries. It gives you catalog data and information on how to get the most from your Diesel Cranking Batteries.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto


NO. 00 B. & S. and 178 Cleveland
auto. screw machine. Berkshire 2341.
WANTED: Several versatile and capable
war-born synthetic gasketing materials
with excellent records, want old or new
packing and sealing problems to solve.
Call FEL-PRO.
FILLING machines—[2] 8 spout bronze
vacuum filler, new. Adjustable 2 oz. to
gallon. Bargain.

SUPERIOR METALLIC PACKINGS

PATENTED—because they are better. In these folded strands of lead, aluminum or copper foil, depending on the service, are plaited in spiral form. The strands and spirals may or may not contain fibrous cores, also depending on the service, and desired resiliency. These packings handle widest heat range, resist caustics, acids, in exacting applications. Get catalog.

Because years of development were compressed into months during war-time, we now find ourselves with new materials of such wide usefulness that ALL of their applications have not yet been explored and catalogued. Before, we knew exactly what each Fel-Pro product could do, and recommended on that basis. Now, we frequently have new uses for these versatile products suggested by customers, or, they state problems and we find we already have the answers in these new synthetics.

That spotlights Fel-Pro's Advantage No. 1—is perpetual engineering curiosity and development, resulting in Technical Know-How. Advantage No. 2 is Fel-Pro's Facilities—the equipment and experience that make possible the economical production of gaskets to highest quality standards. Make those two advantages yours!

FEL-PRO offers a No-Charge Consultation Service

Write today for details of Fel-Pro's No-Charge Consultation Service covering sealing, gasketing, packing and sound and vibration dampening materials . . . the latest developments in this field.

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with Sealing Materials, Gaskets, Packing, Sound- and Vibration-Dampening Materials, Specially Treated, Die-cut and Fabricated by FELT PRODUCTS MFG. CO., 1539 Carroll Ave., Chicago 7, Ill.

1805

ATTACH THIS TO YOUR LETTERHEAD

FELT PRODUCTS, 1539 CARROLL AVE., CHICAGO 7, ILL.
Gentlemen: Without cost or obligation send me latest information on.....
and details of your No-Charge Consultation Service.
MY NAME.....

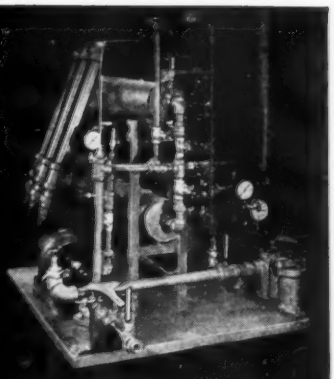
The HEAT Parade

OF PEABODY BURNERS

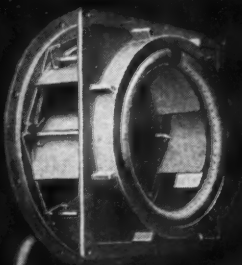
Peabody leads the heat parade of combustion equipment . . . because Peabody has led in concentration and specialization in the field of combustion engineering through the years. Peabody has the "know-how" and the advanced designs to solve your combustion problems.

If you require burners to fire oil, or gas, or pulverized coal, or any combination of these fuels call for a Peabody engineer.

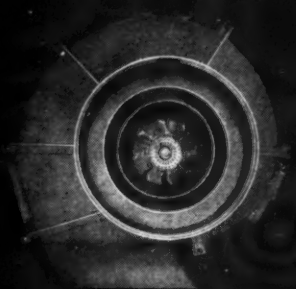
Peabody engineers stand ready to help you select, from the wide variety built, the Peabody equipment that best fits your particular requirements.



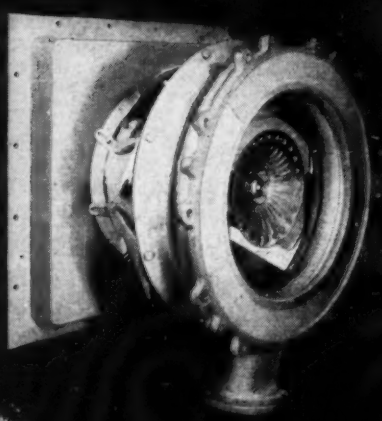
OIL PUMP AND HEATER SET



REFINERY BURNER FOR GAS AND OIL

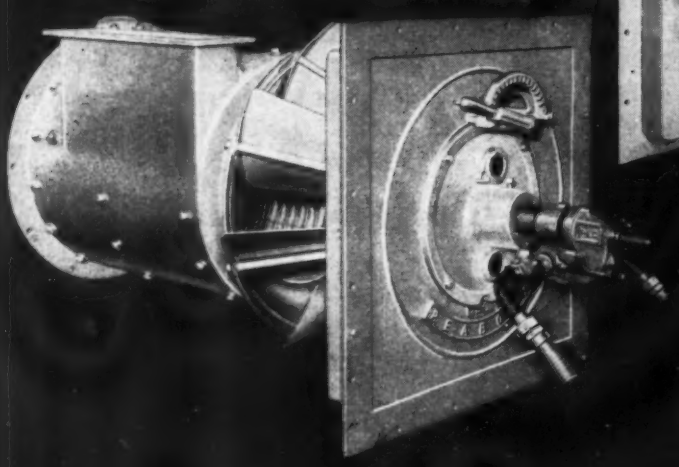


BLAST FURNACE GAS BURNER



COMBINED GAS AND OIL BURNER

COMBINED COAL AND OIL BURNER



To turn on the heat, turn to Peabody

PEABODY ENGINEERING CORPORATION

580 FIFTH AVENUE • NEW YORK

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BUENOS AIRES · MEXICO CITY · MONTREAL

PEABODY LIMITED, LONDON

Condor

WHIPCORD V-BELTS

for Smoother, Steadier Power Application

Once tried—Usually installed—Right down the line. Time lost in making repairs is cut down drastically, because Condor Whipcord V-Belts work as a precisioned team. Starting is smooth, acceleration is uniform. No jerks and shocks, nor lost motion and wasted power. Control is positive. Service and speed are dependable—and long lived. The Whipcord *Strength Member* has low inelastic stretch and is scientifically cushioned in *Flexlastics* for good gripping and cool running at high speeds.

The term FLEXLASTICS is an exclusive Manhattan trade mark. Only Manhattan can make FLEXLASTICS . . . Manhattan Belts will be made in the red color when again possible.

8 POINTS of ADVANTAGE

are evident in the cross-section shown here:

- Wide margin of strength
- Minimum inelastic stretch
- Uniform flexibility
- Maximum resistance to structural breakdown
- Smooth running
- Maximum traction
- High resistance to side wear
- Correct lateral reinforcement

These 8 Points are correctly embodied in every Condor V-Belt. Other factors being equal, the useful life of a V-Belt is limited by excessive stretch

OTHER MANHATTAN PRODUCTS

- Conveyor, Elevator and Transmission Belts
- V-Belts—Multiple, F. H. P.
- Hose of all kinds, wrapped and Molded
- Washers and Gaskets
- Asbestos Friction Material, Brake Lining, Clutch Facings
- Abrasive Wheels
- Diamond Wheels
- Oilless Bearings
- Packing
- Tubing
- Matting—for Switchboard
- Engineered Molded Goods
- Rubber Covered Rolls
- Rubber Lined Tanks and Pipe
- Vibration Dampeners
- Typewriter Platens and Specialties
- Bowling Balls
- Billiard Cushions

RAYBESTOS-MANHATTAN, INC.

MANHATTAN RUBBER DIVISION

EXECUTIVE OFFICES AND FACTORIES — PASSAIC, NEW JERSEY

IN STACKS—
NEW OR OLD

PREVENT CORROSION ...BOOST THE DRAFT

WITH

LUMNITE LININGS

Three 150-ft. Steel Stacks at a large power station. First stack lined with LUMNITE in 1941, second in 1943, third in 1945.

A LUMNITE lining provides thorough protection against the attack of corrosion and heat in a steel stack. It boosts the draft by keeping gas temperature up . . . gives protection from secondary combustion, high-temperature flue gases and overloading. It resists the attack of condensate and sulphurous gases.

The insulating, corrosion-resistant lining is ready for service 24 hours after installation.

FOR OLD STACKS—A LUMNITE lining, shot on with a gun or plastered in place over wire-mesh reinforcement, strengthens the old shell. By providing protection against heat and corrosion, the lining renews the stack for long continued service. The quick lining job gets the stack back at work with minimum time out for reconditioning.

FOR NEW STACKS—A relatively thin lining of LUMNITE heat- and corrosion-resistant concrete will protect the steel indefinitely. The LUMNITE lining placed over mesh reinforcement is jointless, permits no "breathing." Gases or condensate cannot deteriorate the steel. This lining has high structural strength, high heat-resistance and low thermal conductivity.

THE ATLAS LUMNITE CEMENT COMPANY

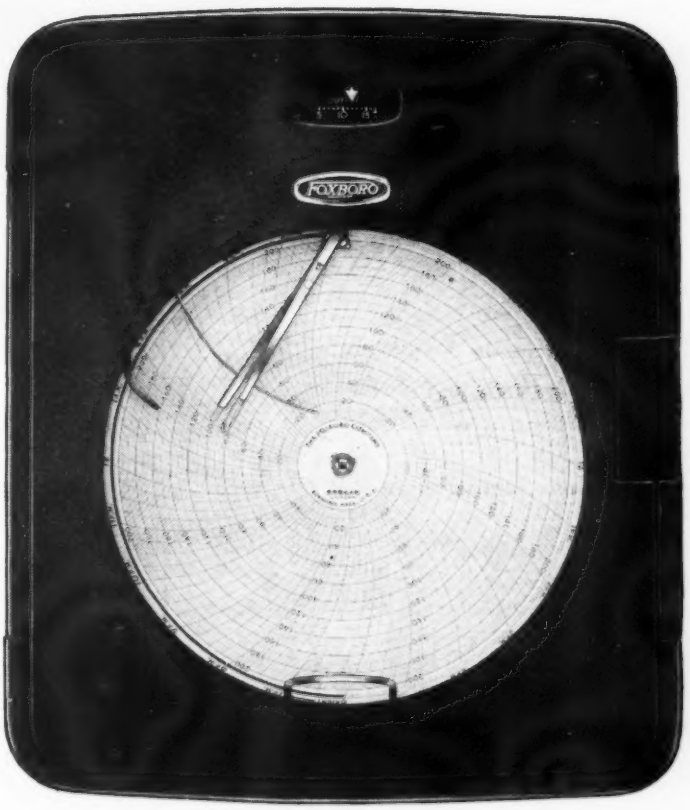
(United States Steel Corporation Subsidiary)

135 East 42nd Street • New York 17, N. Y.

Every known requirement of leading industries, every proved scientific advance in pneumatic control, every advantage of unmatched research and experience, has guided the design of the new Foxboro Model 40 Stabilog Controller. The results are simpler and more rugged construction, easier and more stable adjustments, unequalled performance.

Foxboro 40

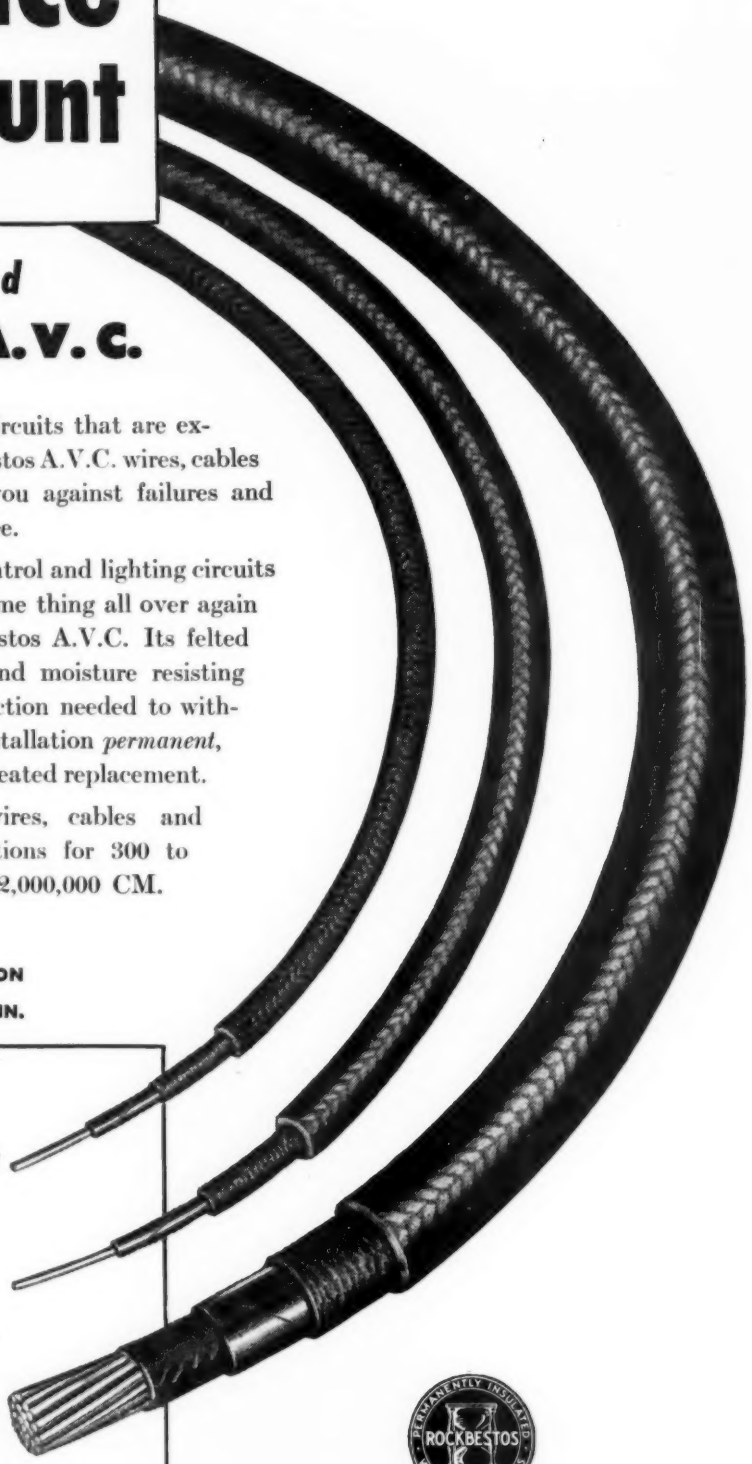
STABILOG* CONTROLLER



Write for complete explanation in Bulletin 381. The Foxboro Company, 68 Neponset Avenue, Foxboro, Mass., U.S.A.

* Reg. U. S. Pat. Off.

First Choice on every count



Permanently Insulated
ROCKBESTOS A.V.C.

There are 9 good reasons why you should wire circuits that are exposed to severe operating conditions with Rockbestos A.V.C. wires, cables and cords . . . and they all combine to *insure* you against failures and practically eliminate expensive circuit maintenance.

You won't have to pull out and replace power, control and lighting circuits that are failing too often . . . and then do the same thing all over again . . . if you rewire with *asbestos insulated* Rockbestos A.V.C. Its felted asbestos walls, impregnated with heat, flame and moisture resisting compounds, are built to give you the *extra* protection needed to withstand conditions that ruin wire. They make an installation *permanent*, protect circuit operation and save the cost of repeated replacement.

These *permanently insulated* money-saving wires, cables and cords are made in a wide variety of constructions for 300 to 5000 volt service . . . in sizes No. 18 AWG to 2,000,000 CM. For complete data write for a catalog.

ROCKBESTOS PRODUCTS CORPORATION
140 NICOLL ST., NEW HAVEN 4, CONN.

1. **Won't age or deteriorate**
2. **Won't bake brittle, crack or flow under heat**
3. **Won't burn or carry flame**
4. **Corrosive fumes won't rot it**
5. **Remains permanently flexible**
6. **Resists oil, grease and moisture**
7. **Withstands conductor-heating overloads**
8. **Gives greater current carrying capacity**
9. **Reduces circuit maintenance expense**

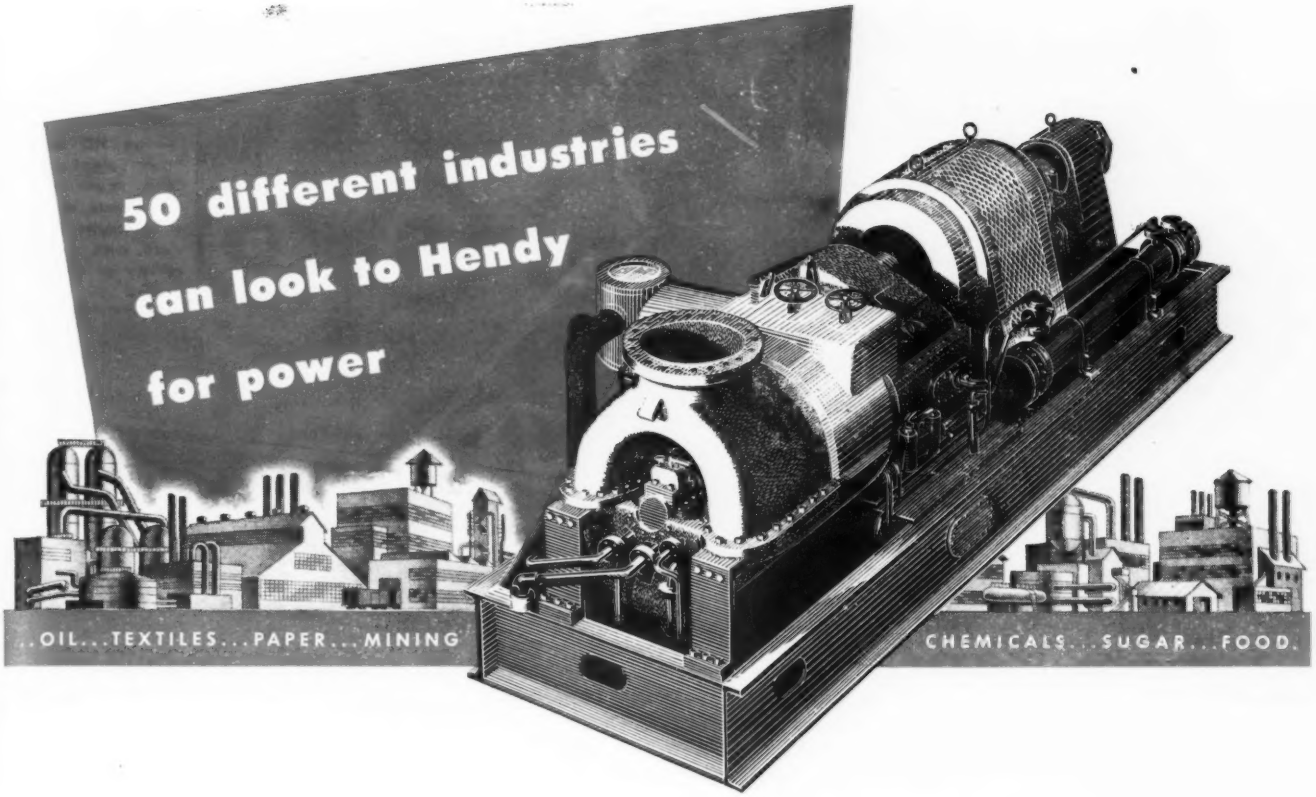
These characteristics are built into 125 Rockbestos constructions including the wires illustrated:

Rockbestos A.V.C. 600 Volt Switchboard Wire.
Rockbestos A.V.C. 600 Volt Boiler Room Wire.
Rockbestos A.V.C. 600 Volt Power Cable.

PERMANENTLY INSULATED ROCKBESTOS WIRES AND CABLES

ROCKBESTOS A.V.C.
The Wire with Permanent Insulation

NEW YORK BUFFALO CLEVELAND CHICAGO
PITTSBURGH ST. LOUIS LOS ANGELES
SAN FRANCICSO SEATTLE PORTLAND, ORE.



Out of the war have come many advances in the design and manufacture of power plants. The same Hendy engineers who amazed the world by their skill and speed in perfecting power for *war,* have now turned their talents to *power for peace.* For many industries—and probably yours—Hendy can supply modern power units that will mean lower-cost production for the vital, competitive years ahead. Our organization will gladly work with your engineers in preparing a preliminary survey and estimate.

WRITE FOR LITERATURE

describing steam turbines and turbo-generators, medium- and heavy-duty Diesels, and Diesel-electric sets engineered by Hendy to meet the power needs of post-war industry.

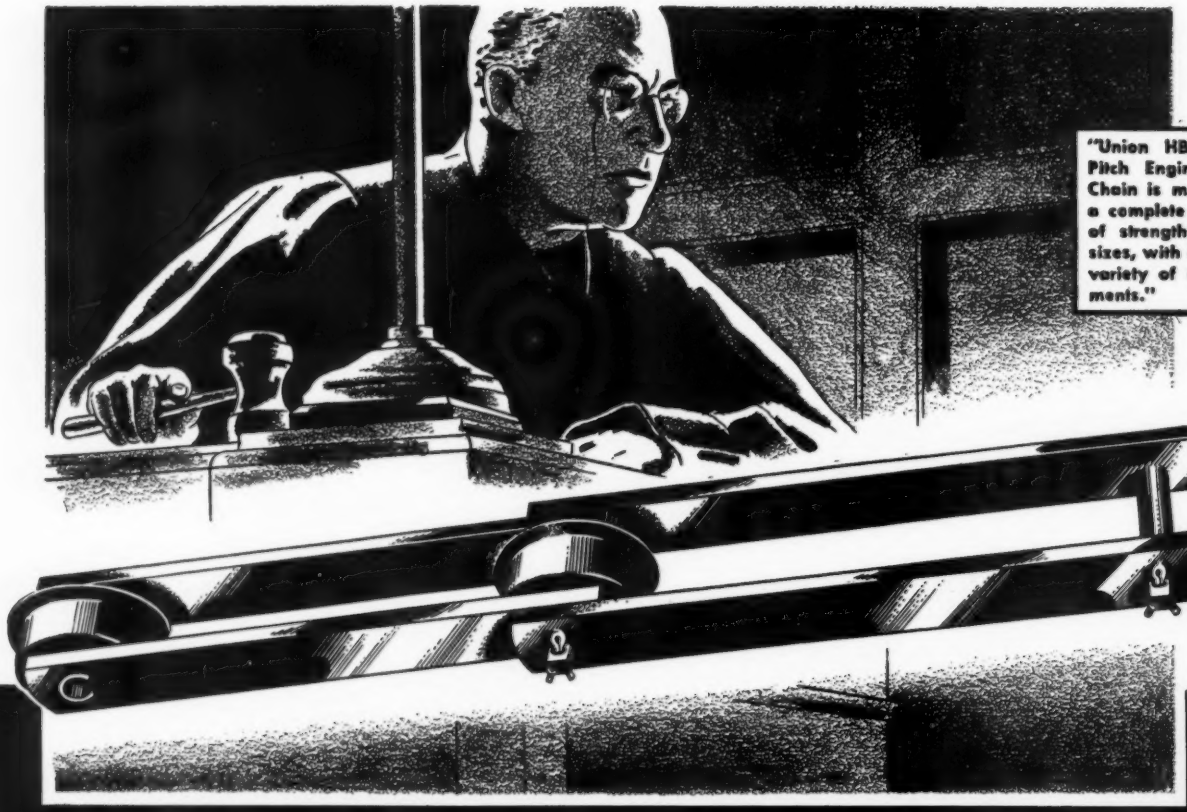
Power by HENDY

Engineered to suit your needs

JOSHUA HENDY IRON WORKS • SUNNYVALE, CALIF.

CROCKER-WHEELER ELECTRIC MANUFACTURING COMPANY DIVISION, AMPERE, NEW JERSEY

Branch Offices: BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • WASHINGTON



"Union HB Long Pitch Engineering Chain is made in a complete range of strengths and sizes, with a wide variety of attachments."

The Weight Of Evidence Favors Chain

☆ Every time you face a problem of power transmission or materials handling, chain usually offers sufficient evidence in its favor to win your decision.

When you are ready to choose between makes of chain, consider the case for Union, which devotes its manufacturing facilities exclusively to the fabrication of a complete line of steel chains, sprockets and flexible couplings for the transmission of power and the handling of material. Every particle of Union engineering and manufacturing skill is concentrated on designing and building chains which will render plus service to our customers. Try Union and be the judge!

The Union Chain and Manufacturing Company, Sandusky, Ohio, U. S. A.

Catalog A-2 covers Drive and Conveying Chain. B-2 covers Finished Steel Roller Chain. FC-1 covers Flexible Couplings. Ask for your copies.

ARMY ★ NAVY

UNION CHAINS

Union Chains for Every Application

Drive and Conveying Chains and Sprockets
- Bridge Chain
- Combination Malleable Iron and Steel Chain
- HB (hardened bearing) type chain
- BP (bar and pin) type chain

★

Finished Steel Roller Chains and Sprockets
- All manufacturer's standard, size ⅜ in. to 2½ in. pitch
- Single and Multiple Strands
- Extended Pitch Series in sizes 1¼ in. to 4 in. pitch

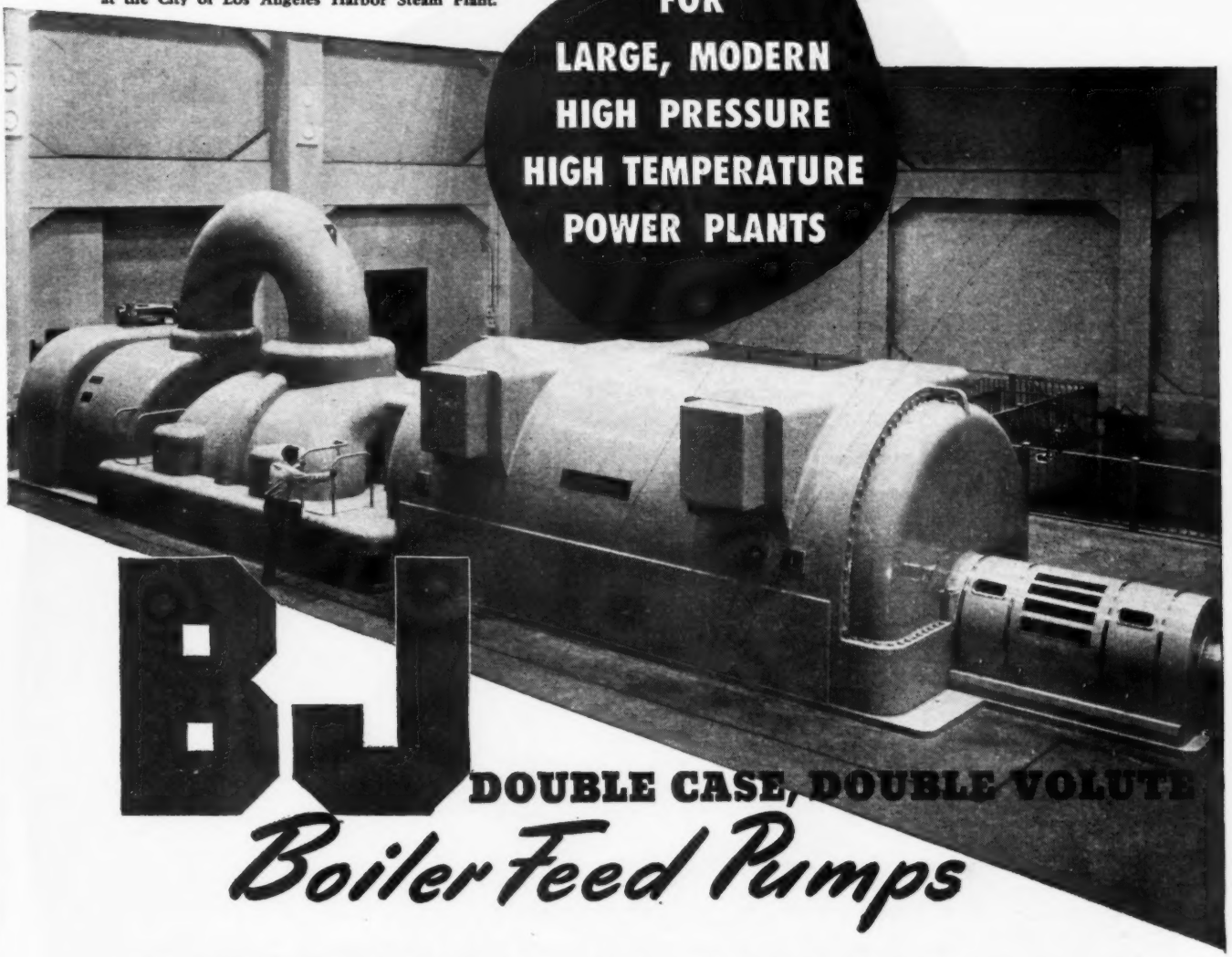
★

Silent Chain and Sprockets
- All sizes ⅜ in. to 1½ in. pitch

★

Flexible Couplings
- Roller chain type
- Silent chain type

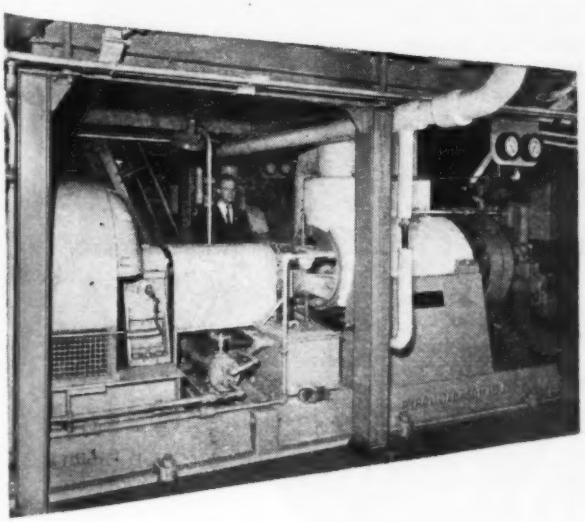
1,125,000 POUNDS PER HOUR of feed water are pumped by three BJ Boiler Feed Pumps in the operation of this magnificent 65,000 KW Steam turbine-generator set (Manufactured by Westinghouse)... at the City of Los Angeles Harbor Steam Plant.



FOR LARGE, MODERN HIGH PRESSURE HIGH TEMPERATURE POWER PLANTS

BJ DOUBLE CASE, DOUBLE VOLUTE *Boiler Feed Pumps*

ON THE FLOOR BELOW... One of the three 6" by 11", 9-Stage, double case BJ Boiler Feed Pumps. Each pump delivers 375,000 pounds per hour of feed water. *Water temperature:* 360°F; *Total Differential Pressure:* 1250 psi; *Drive:* 900 hp, 3 phase, 60 cycle motor.



The Double Case, Double Volute Boiler Feed Pump, a Byron Jackson Co. development, is superior to any other design for feeding High Pressure, High Temperature Boilers in Modern Power Plants. Outstanding features of this pump include:

HORIZONTALLY SPLIT INNER CASE

AXIAL & RADIAL THRUSTS ELIMINATED

HEAVY BOLTING OF HORIZONTAL SPLIT NOT REQUIRED

BALANCE DISK, DRUM OR FLOATING SEAL NOT USED

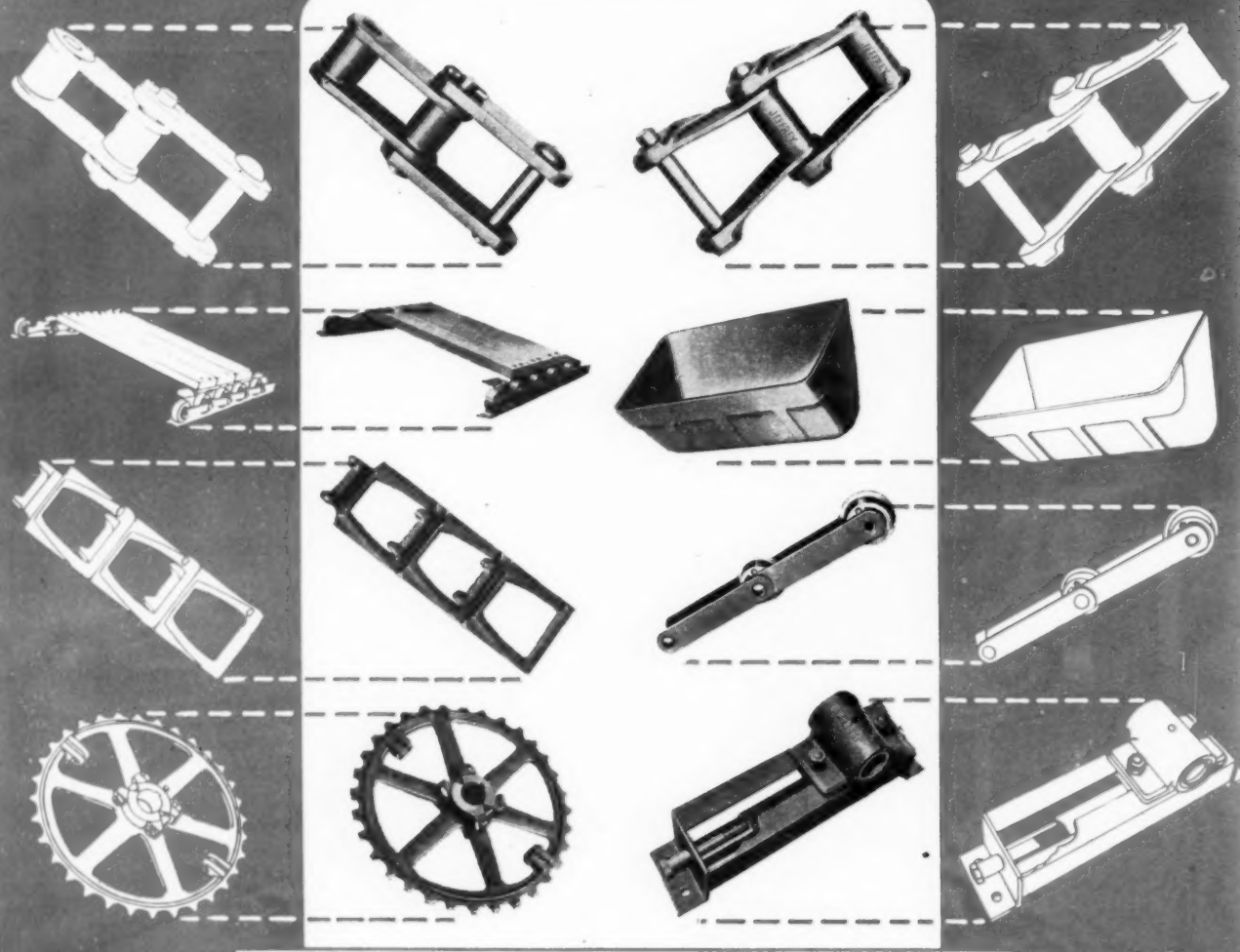
LOW STUFFINGBOX PRESSURES

EASILY & QUICKLY DISMANTLED & REASSEMBLED

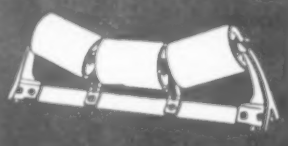
Capacities: to 1,000,000 lbs. per hr.
Pressures: 1,000 to 2,800 psi.

Byron Jackson Co.
LOS ANGELES 54, CALIFORNIA
Offices in Principal Cities

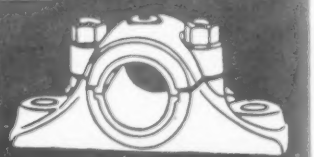
Specify Jeffrey



REPLACEMENT PARTS
THAT FIT THE SPOT



Genuine Jeffrey Replacement Parts are made to the exact specifications of original equipment. Their precise fit lowers installation time. Add to that the frequent improvements made by Jeffrey engineers and metallurgists and you have maintenance parts that give long, smooth and efficient service. Will interchange and couple with most industrial standard designs.



THE JEFFREY MANUFACTURING COMPANY

ESTABLISHED 1877

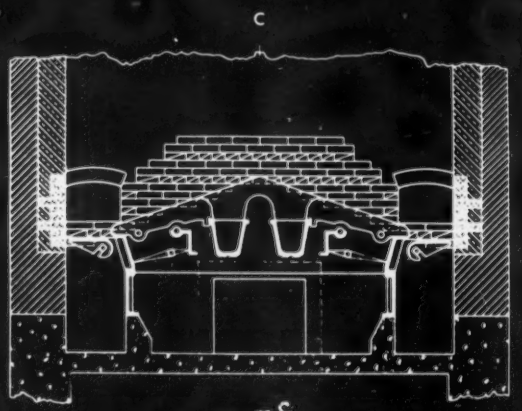
932-99 North Fourth St., Columbus 16, Ohio

Baltimore 1 Buffalo 2 Cleveland 13 Harlan Milwaukee 11 Pittsburgh 22
Birmingham 3 Chicago 1 Denver 2 Houston 5 New York 7 St. Louis 3
Boston 14 Cincinnati 2 Detroit 13 Huntington 19 Philadelphia 3 Salt Lake City 9
Scranton 3

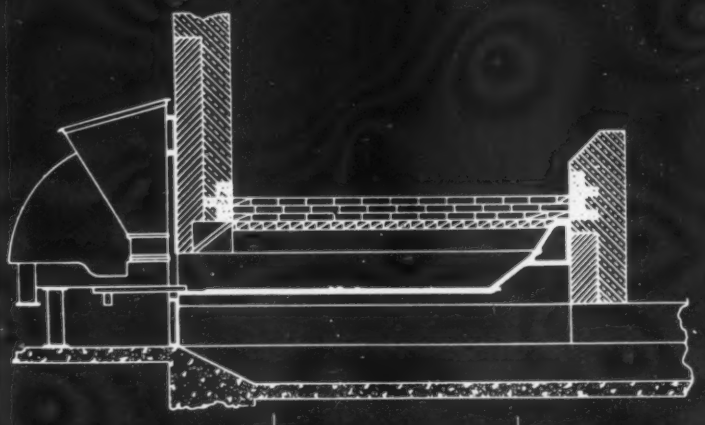
WALL BRICK DATA

"F & E" Underfeed STOKER

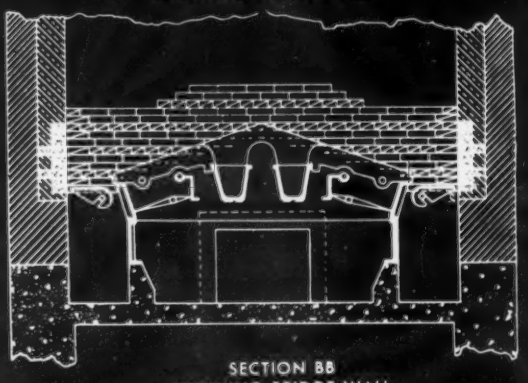
Planning to get more steam cheaper



SECTION AA
SHOWING FRONT WALL



SECTION CC
SHOWING SIDE WALL



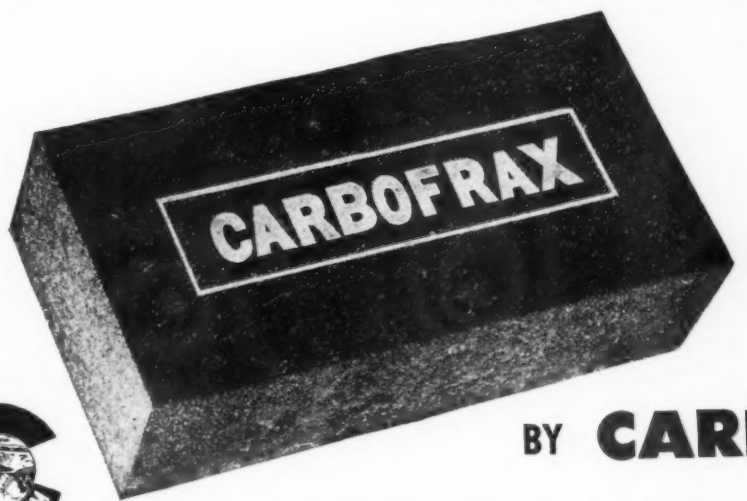
SECTION BB
SHOWING BRIDGE WALL

Greater capacity and lower cost result when an "F & E" underfeed stoker fired boiler furnace is efficiently equipped with a CARBOFRAX silicon carbide brick setting. Lining coverage, as shown here, can be altered of course to accommodate variations in actual on-line working conditions.

Increased steaming production is directly tied to these two basic features of CARBOFRAX brick. The first—an exceptional resistance to steady punishment. Continuous, on-line service is secured. The second—a dense, nonsoftening surface which is impenetrable to clinkers. Large, restrictive clinker formations cannot build out on the walls.

Free from choking clinkers, the entire grate area is available. This means much more efficient fuel combustion, a more active fire, and lower fuel costs. While the longer life of a CARBOFRAX installation effects a marked reduction in maintenance and replacement expense. Reports of 8 to 10 years service are by no means infrequent.

These, and many other advantages, follow the use of CARBOFRAX brick in the clinker zone of stoker fired furnaces. Actual operating figures offer definite proof. It pays to get the complete story. Just request a copy of the technical booklet "CARBOFRAX in Boiler Furnaces." Address your inquiry to Dept. G-66, and we'll see that it is sent to you at once. The Carborundum Company, Refractories Division, Perth Amboy, New Jersey.



BY CARBORUNDUM
TRADE MARK

"Carborundum" and "Carbofrax" are registered trademarks which indicate manufacture by The Carborundum Company

are you getting the benefits of OTIS MAINTENANCE SERVICE?

In the past ten years the number of Otis elevators under Otis Maintenance more than doubled. It also more than doubled in the previous ten years.

Under Otis Maintenance building owners and managers are freed from all details of elevator care and repair. At the same time tenant satisfaction is increased, more freight is moved and time saved. Those are the reasons why owners and managers know that Otis Maintenance pays.

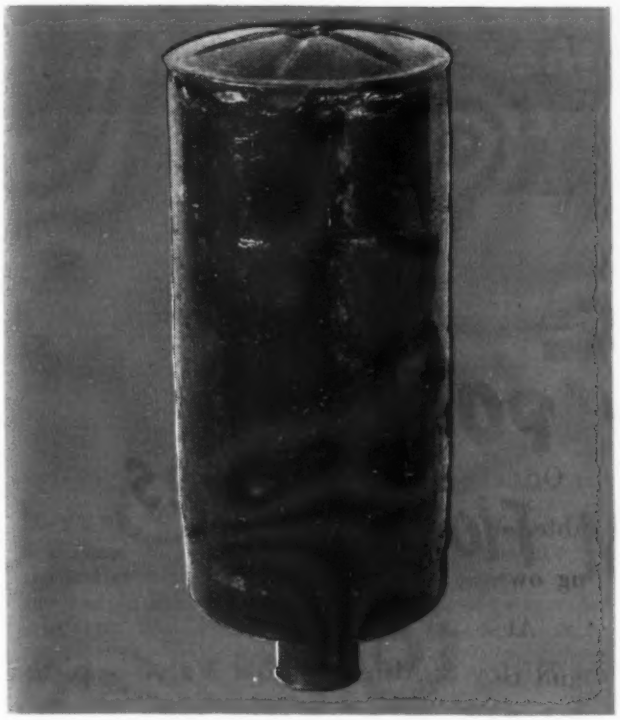
Otis Maintenance is a home town service because it operates through 245 branch offices, each adapted to the area it serves. It is an integrated national enterprise because it brings the research, engineering and production facilities of the manufacturer directly to your door.

Otis Maintenance is for Otis elevators. It is available at a flat monthly rate through your local Otis office.

Not only long Otis life, but peak Otis efficiency. This Otis maintenance man is checking the speed of an elevator to be sure it is delivering good service.

Otis ELEVATOR COMPANY
OFFICES IN ALL PRINCIPAL CITIES

Diesel Engine DANGER points

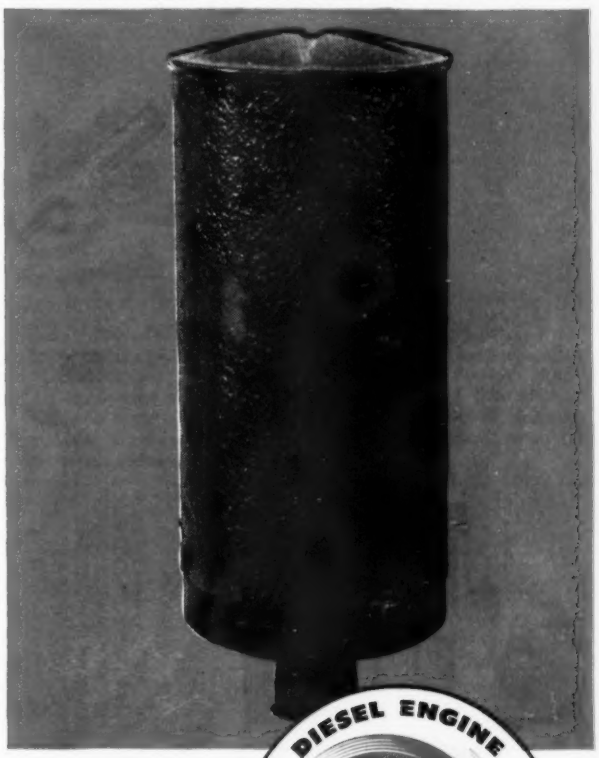


Filter deposits formed in 204 hours with best uncompounded mineral oil.

Clogged Oil Filters Cause Frequent Shutdowns

One cause of frequent costly and time-wasting Diesel shutdowns is filter clogging. The condition can become dangerous since a clogged filter may stop circulation of oil to the engine if the warning of a drop in oil pressure is not heeded. Analysis of filter deposits prove them to be composed of products resulting from incomplete burning of the fuel and oxidation of oil plus iron, silica and water.

Filter Deposit formed in 1230 hours with RPM DELO Oil.



RPM DELO Oil Reduces Filter Clogging Two Ways

As the two filters illustrated show, RPM DELO Diesel Engine Lubricating Oil greatly lengthens the time between shutdowns for filter servicing. This is accomplished in two ways:

1. A detergent in RPM DELO Oil prevents the stuck piston rings which, through blow-by, permit dust, unburned fuel and carbon to mix with oil.

2. Another compound in RPM DELO Oil fortifies it against oxidation.

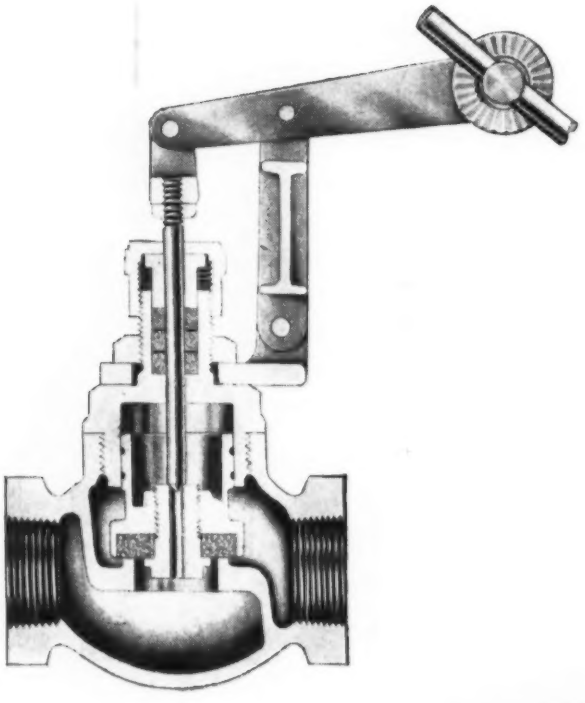
Other additives in RPM DELO Oil protect Diesel Engines against corrosion, excessive wear on upper cylinder walls, and foaming.

DIESEL ENGINE RPM DELO LUBRICATING OIL

To match the fine performance of RPM DELO OIL, use these equally efficient companion products from the same famous "RPM" line—RPM HEAVY DUTY MOTOR OIL—RPM COMPOUNDED MOTOR OIL—RPM GEAR OILS AND LUBRICANTS—RPM GREASES. For additional information or name of your distributor, write any of the companies below:

STANDARD OF CALIFORNIA · 225 Bush St., San Francisco 20, California
THE CALIFORNIA COMPANY · 17th and Stout Streets, Denver 1, Colorado
STANDARD OIL COMPANY OF TEXAS · El Paso, Texas
THE CALIFORNIA OIL COMPANY · 30 Rockefeller Plaza, New York 20

LOW FLOAT POWER required in K&M Float Valves



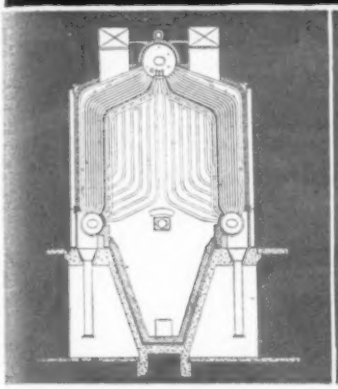
The new Kieley & Mueller Float Valve — piston balanced and pilot operated — is more responsive and more dependable in any service involving control of supply or drain in open or closed tanks, towers or reservoirs. Valve may be installed inside or outside of vessel, and submerged if desired. Shut-off is positive, operation is quiet, and minimum float power is required. Type 830 is all bronze, for pressures of 5 to 150 lbs., available in globe or angle patterns, with interchangeable discs for cold water or hot water to 350°. Sizes ½″ to 2″ with screwed ends. Type 834 valves are similar but are semi-steel, for pressures to 250 lbs., and have flanged ends in 2″ to 12″ sizes.

Write for Catalog 66-C

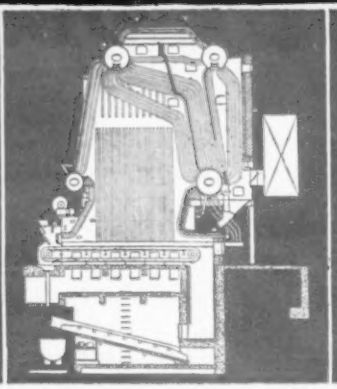
KIELEY & MUELLER, INC.
MANUFACTURERS OF PRESSURE AND LEVEL CONTROLS SINCE 1879
NORTH BERGEN, NEW JERSEY

• DIRECTORY of UNION • BOILERS

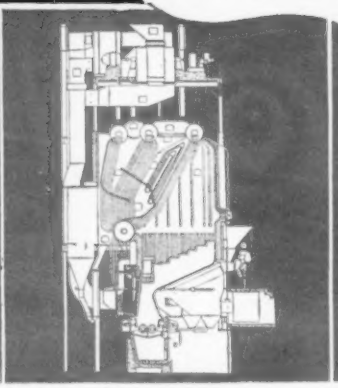
UNION IRON WORKS • ERIE, PENNSYLVANIA



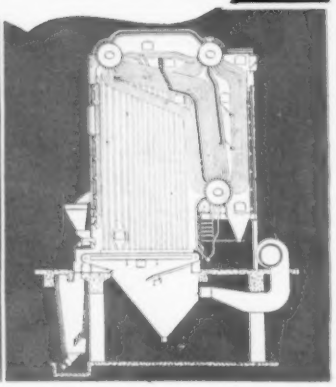
H-TYPE, a self-contained steel cased generator unit for any fuel or firing method, for any desired capacity or pressure.



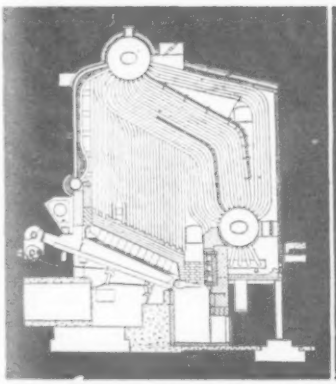
N-TYPE, 4-drum steam generator doubles the radiant surface of other designs without the use of water walls and auxiliary headers.



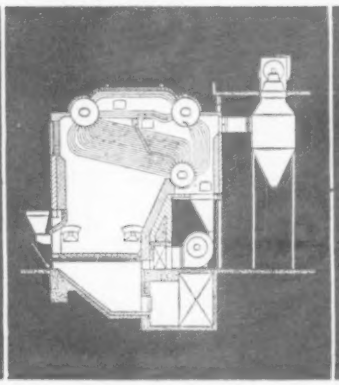
B-TYPE, 4-drum design. Gas, Oil or low fusion Western coal can be readily burned in this furnace which is water cooled and provided with cast iron armor protection.



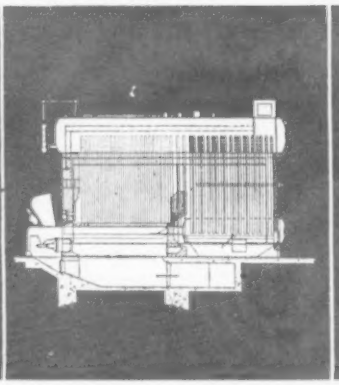
A-TYPE, 3-drum design with special front bank tube curvatures to increase the radiant surface, accelerating speed of circulating and rate of steaming.



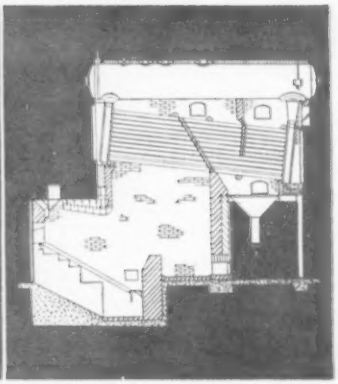
O-TYPE, fully water cooled furnace with all water wall supply tubes inside the setting. A minimum of unprotected brick-work is exposed in the furnace.



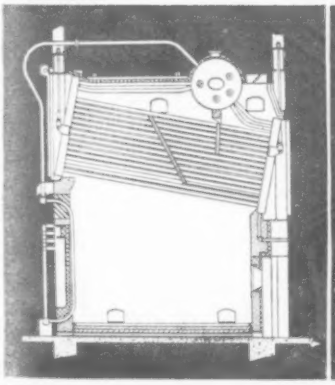
L-TYPE, for low headroom conditions, two top drums at the same level providing maximum steam disengaging surface. Many sizes can be shipped shop assembled.



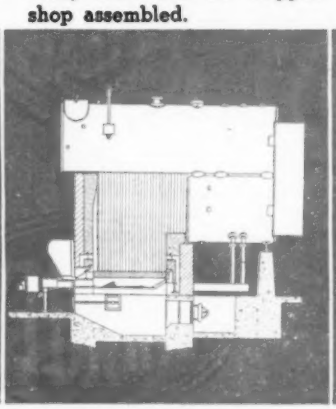
S-TYPE, provides water walled furnace that does not require circulator connections, the setting except for front and bridge walls is constructed of refractory tile water cooled, insulated steel panel cased.



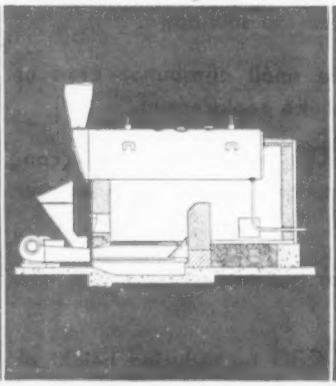
LD-TYPE, long drum with box header construction with either single or double horizontal drums. A thoroughly standardized unit built in units as large as 7,000 square ft. of heating surface.



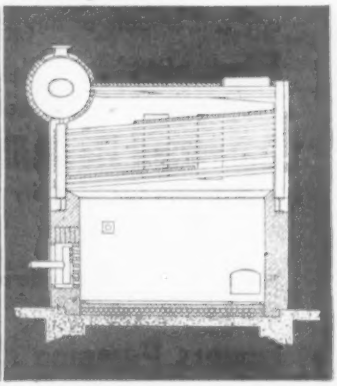
XD-TYPE, cross drum box header type, with steep inclination to the main tube bank to promote rapid circulation — Smaller sizes can be shipped fully assembled or tube bank assembled and drum detached.



UNIVERSAL, fire tube boilers sizes to 300 H. P. (1) for brick setting — (2) steel cased refractory lined in self-contained units — (3) either of these styles with water cooled furnaces.

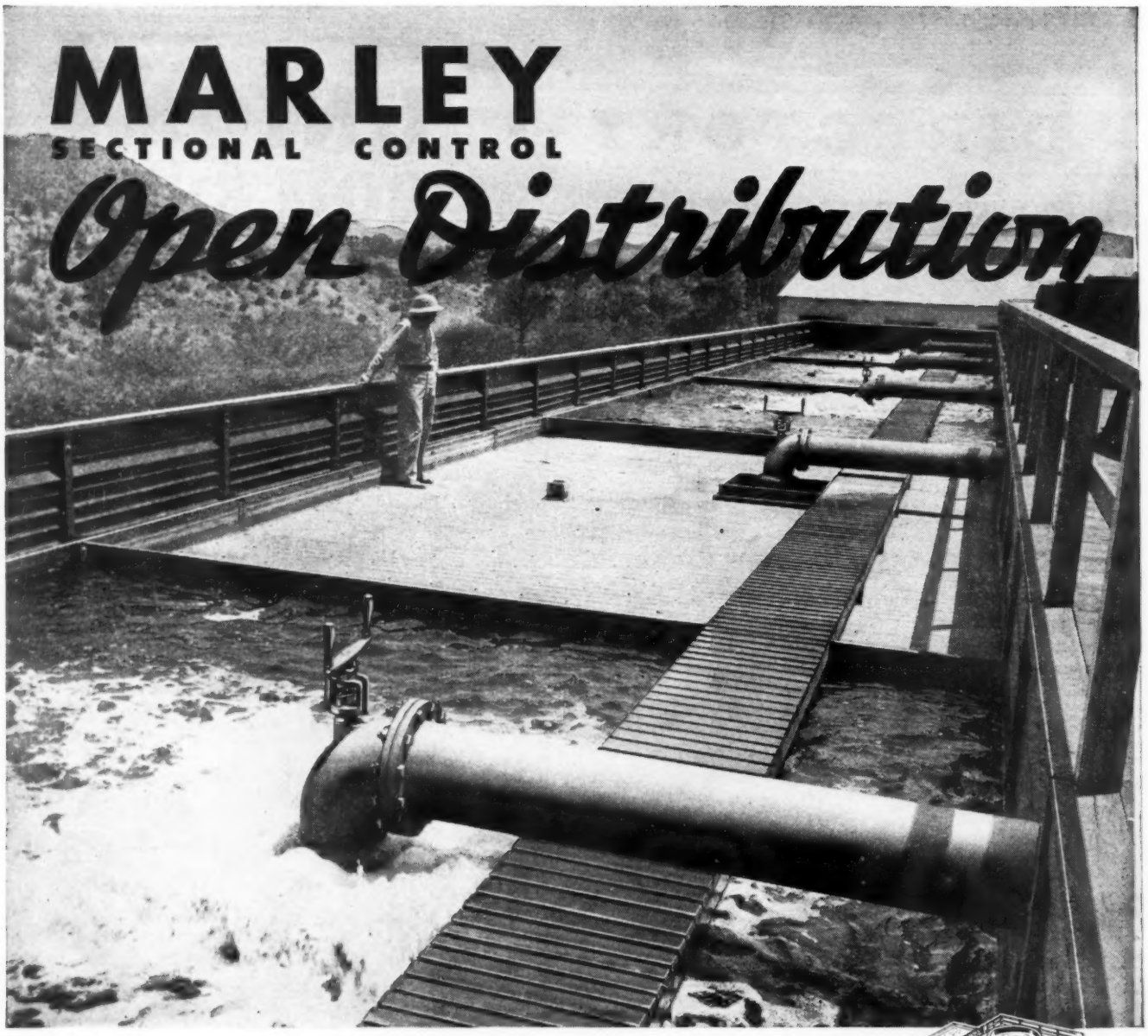


LITTLE GIANT, a shop assembled unit combining pressure element and steel refractory lined furnace — one piece boiler shell — 9 sizes 10 to 75 H.P. for 100 or 150 lb. W. S. P.



KD-TYPE, a knocked-down cross drum type boiler adapted from the Union Cross Drum Power Boiler design. No field welding required. 14 sizes from 2996 thru 34,119 sq. ft. E. D. R. S. H. B. I. steam rating.

MARLEY
SECTIONAL CONTROL
Open Distribution



Only **Marley DOUBLE-FLOW TOWERS** *provide exposed, gravity flow distribution with all these advantages:*

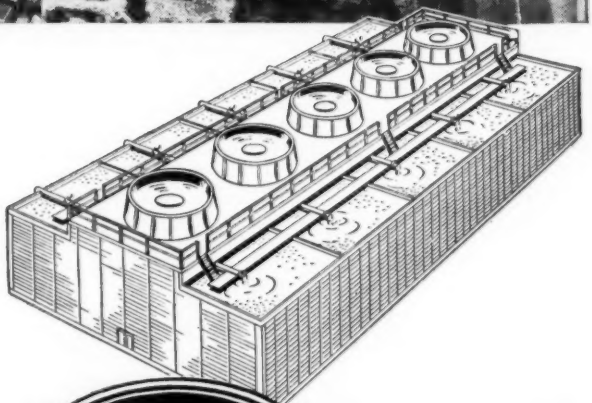
Full Accessibility for inspection or cleaning of any cell or part of any cell—no shut-down.

Eliminates inaccessible small distribution arms or troughs that clog and require replacement.

Operating Flexibility—Water flow readily controlled from full capacity to any desired minimum over each cell.

Adaptability to side or end inlet piping connections at no extra cost.

Lowers Pumping Head by reducing height of water lift and eliminating forced distribution.

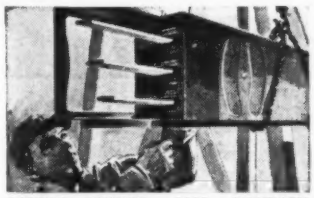


MARLEY COOLING TOWERS

THE MARLEY COMPANY, INC. • KANSAS CITY 15, KANSAS

Plugged in . . . power on . . . time 12 minutes

NO WAITING FOR POWER *with a BUStribution System—simply raise the plug to the nearest plug-in opening, snap its contact fingers over the busbar conductors and bolt the plug to the duct casing. The plug itself is a current protective device for the machine it serves.*



SCREW DRIVER AND WRENCH *are all the tools you need to completely dismantle and reassemble a BullDog BUStribution System. Made up of prefabricated, standardized sections, the entire system can be used again and again in new combinations and at new locations. No fabrication on the job is necessary.*

NO SCRAP WITH ANY MOVE! *There is no waste when you move a BullDog BUStribution System from one location to another. The component materials—steel duct, copper bus bars and vitreous porcelain—do not readily deteriorate and can be used indefinitely.*

Capacities: Feeder Type — 600 Amps. to 4000 Amps.; Plug-in Type —225 Amps. to 1350 Amps.

You Can Do It With BullDog BUStribution DUCT

Quick production changes are easy to make in a plant equipped with BullDog BUStribution Duct, because each 10-foot section has ten handy plug-in outlets for the ready insertion of circuit-protective plugs to convey current from the bus bars in the duct to the machine.

One machine or a whole battery of machines can be moved—anywhere in your plant—without costly delays for rewiring. It's actually less than a 12-minute job to plug in a machine at any new location—and you cut in the power without down time for the rest of the line.

Because they are prefabricated, BullDog Bus Duct systems save countless hours of installation time. And their flexibility gives you power and light where they are needed and when they are needed. BullDog Duct systems can be moved quickly from one production set-up to another with complete re-use of all material and full protection against accidental short circuits.

If you would like to learn more about this flexible, economical method of power distribution, call a BullDog field engineer, or write for descriptive folders.

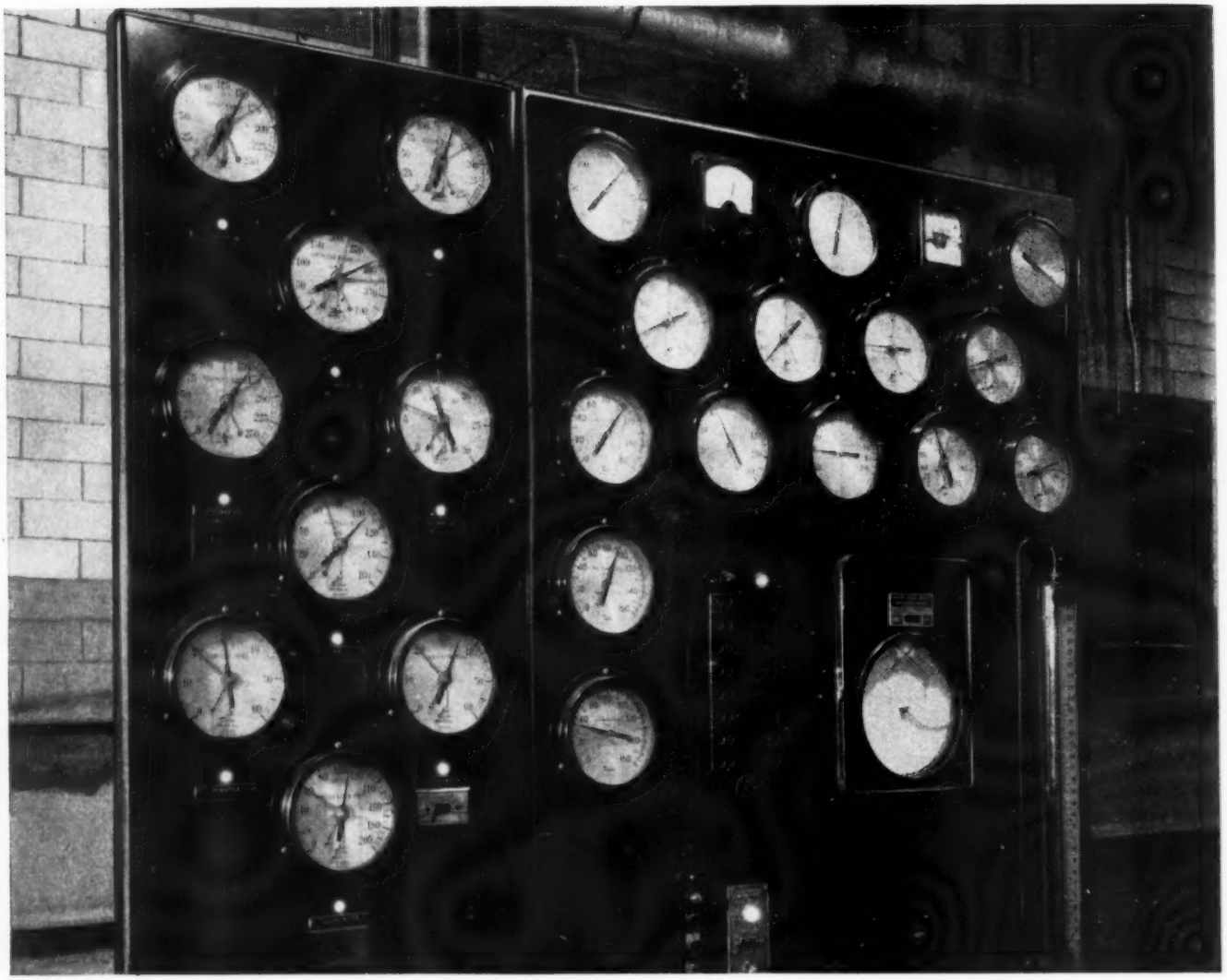
BullDog Also Manufactures Vacu-Break Safety Switches—SafToFuse Panelboards —Switchboards—Circuit Master Breakers—Industrial Trol-E-DUCT for Portable Tools, Cranes and Hoists—Universal Trol-E-DUCT for completely flexible lighting.

BULLDOG

ELECTRICAL DISTRIBUTION SYSTEMS

BULLDOG ELECTRIC PRODUCTS COMPANY, BOX 177, R. PK. ANNEX, DETROIT 32, MICHIGAN.
In Canada: BullDog Electric Products, Ltd., Toronto. Field Engineering Offices in All Principal Cities.

Eyes that cry when you're in trouble

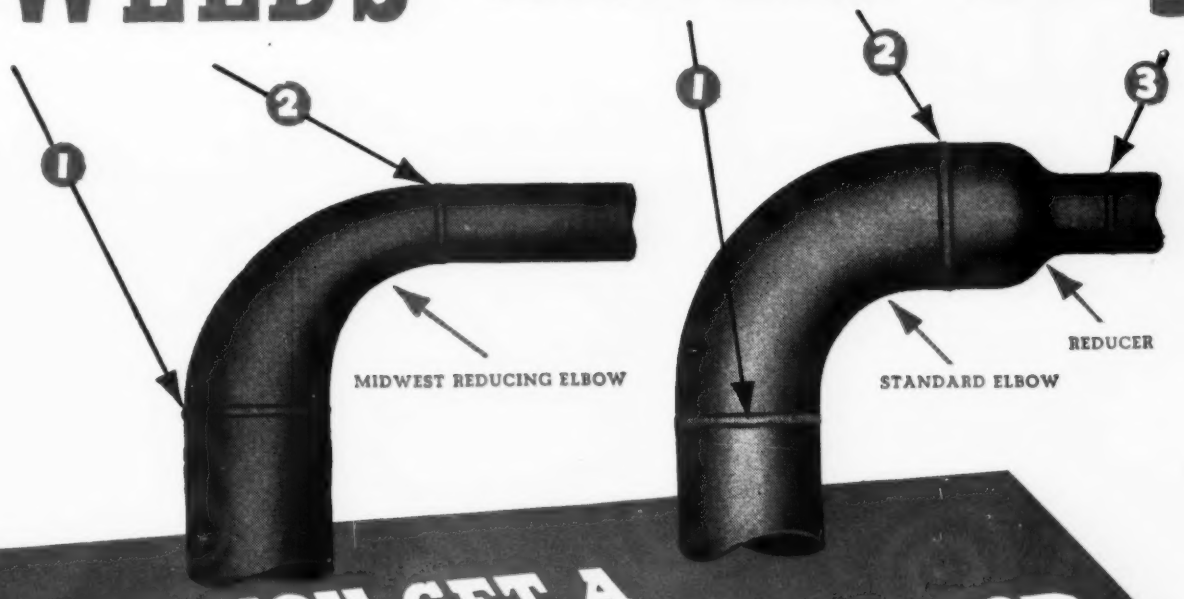


THESE "eyes" are standing by ready to "cry" when trouble strikes in any part of the power plant. They're Taylor Dial Thermometers, equipped with electric alarm devices that tell you of approaching danger through an increasing or decreasing temperature. Their warning cry can take the form of lights, bells, horns, whatever you prefer.

Many power plants are now using these alarm thermometers on transformers, coal-air mixture in powdered coal ducts, air compressor discharge, turbine and generator bearings. You can depend on their accuracy—because Taylor has meant "Accuracy First" since 1851. Ask your Taylor Field Engineer for full details. Taylor Instrument Companies, Rochester, N.Y., and Toronto, Canada. *Instruments for indicating, recording, and controlling temperature, pressure, humidity, flow, and liquid level.*

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

2 WELDS INSTEAD OF 3



AND YOU GET A BETTER PIPING JOB

MIDWEST

REDUCING WELDING ELBOW

- SAVES WELDING
- SAVES MONEY
- SAVES TIME
- REDUCES TURBULENCE
- IMPROVES APPEARANCE

One weld is eliminated when the Midwest Reducing Elbow is used to change both direction and pipe size in a welded pipe line . . . you make only two welds instead of three. This exclusive Midwest Fitting takes the place of both a standard elbow and a reducer, as shown above. This saves time and money, produces a smoother, cleaner, better appearing job. In addition, the gradual reduction, smooth curve and absence of abrupt neck reduce turbulence. Insulation is also easier.

All the advantages of Midwest Standard Elbows are to be found in Midwest Reducing Elbows . . . unusual dimensional accuracy, beneficial effect of working metal in compression, stress relieving, etc. Center-to-end dimensions are the same as for standard elbows with which they are interchangeable.

This reducing elbow is one of many Midwest Welding Fittings designed to reduce the cost and improve the quality of welded piping. Write for Bulletin WF-41 for complete information.

MIDWEST

PIPING & SUPPLY COMPANY, Inc.

Main Office: 1450 South Second St., St. Louis 4, Mo.

Sales Offices: New York 7—30 Church St. • Chicago 3—645 Marquette Bldg. • Los Angeles 33—520 Anderson St. • Houston 2—229 Shell Bldg. • Tulsa 3—533 Mayo Bldg. • Atlanta 3—Red Rock Bldg. • South Boston 27—426 First St. • Distributors in Many Cities.

MIDWEST WELDING FITTINGS IMPROVE DESIGN AND REDUCE PIPING COSTS

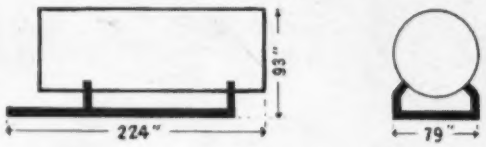
STEAM

when you want it

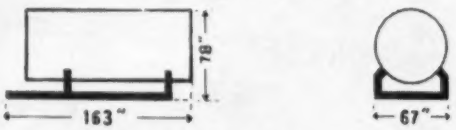
-at minimum cost!

A Cyclotherm may be installed anywhere —functions without foundation, pitting or stack. Note favorable "go-thru" dimensions.

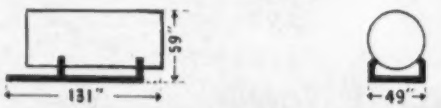
200 H. P. MODEL



100 H. P. MODEL



40 H. P. MODEL



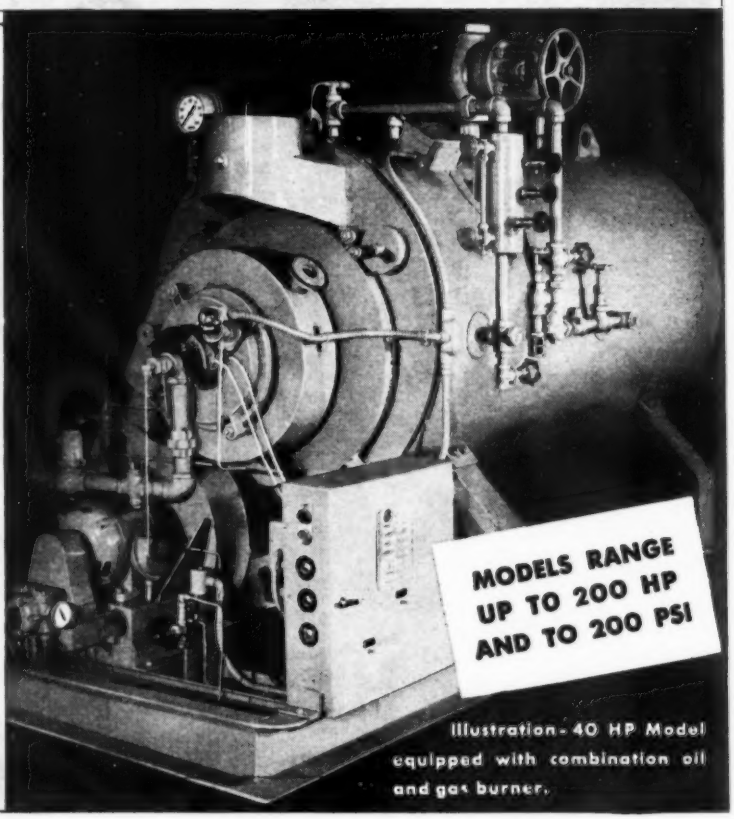


Illustration - 40 HP Model equipped with combination oil and gas burner.

COSTS LESS TO INSTALL— LESS TO OPERATE

Cyclotherm Steam Generators are designed for operation with modern fuels to meet modern steam problems! They are low in initial cost and may be installed easily, speedily and economically.

Quick Steaming—High Efficiency

Exclusive Cyclotherm engineering features give you very quick steaming, combined with adequate steam capacity so that heavy, peak loads may be satisfied without pressure drop. The operating efficiency of Cyclotherm units will be not less than 80%. All Cyclotherm units may be fired with light oil or gas; heavy oil operation in sizes from 50 to 200 HP. Units may also be equipped with a combination oil-gas burner that permits quick change-over from one fuel to the other by merely throwing a switch.

Automatic Controls—Wide Range Modulation

All Cyclotherm units are fully automatic in their operation and require only the minimum of attention and maintenance. Units from 50 to 200 HP are equipped with wide range modulating controls that fire the unit from 30 to 100% of capacity in response to steam demand—Cyclotherm efficiency remains at the same high rate throughout the range of modulation, and steam pressures are maintained on an even level.

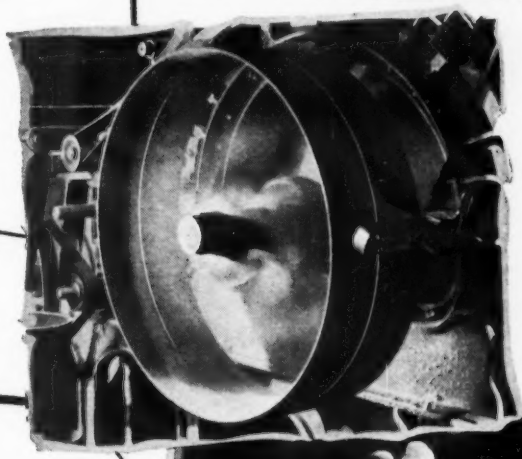
Cyclotherm units come in sizes from 5 to 200 HP and in pressures from 15 to 200 psi. They are shipped complete with boiler, burner, all controls and accessories assembled—fully piped, wired, test fired for performance and ready to operate on arrival.

Write, wire or phone for more complete information.

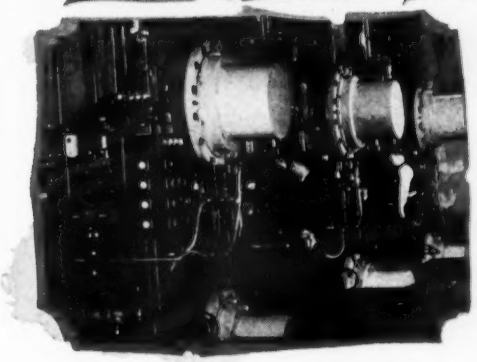
CYCLOTHERM STEAM GENERATORS

CYCLOTHERM CORPORATION, 90 BROAD STREET, BOX 802, NEW YORK 4, N. Y.

"Bearings RUN 10% COOLER



SINCE CHANGING TO Tycol industrial Greases"



"Production speeded 65%...
Repair costs slashed 30%...
Deposits eliminated...
Highly stable—doesn't leak...
Consumption cut 25%..."

This report from a plant engineer typifies the kind of trouble-free, cost-cutting lubrication provided by Tycol Industrial greases. They contain more high-grade cylinder oil — less soap — which means better performance in every application.

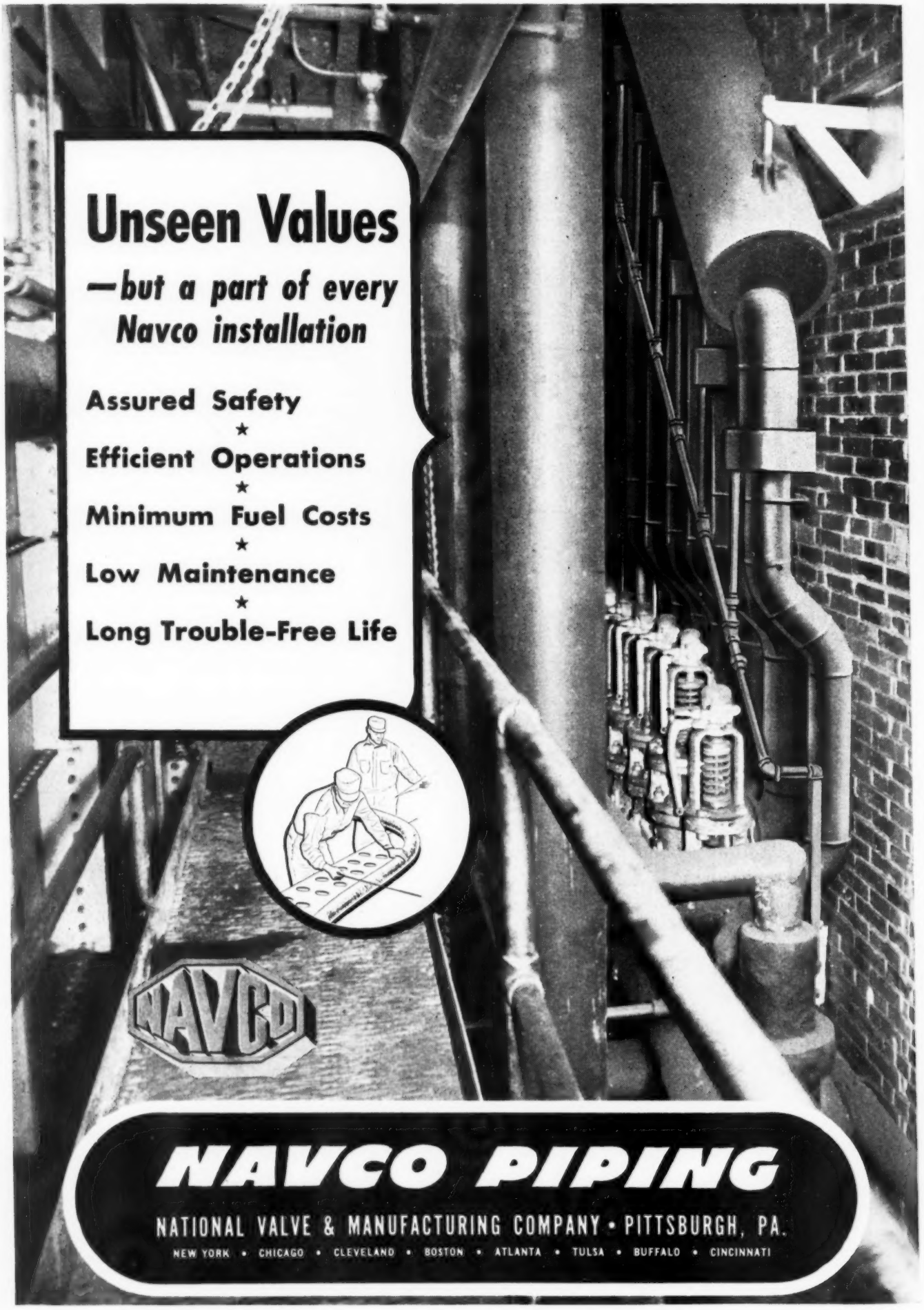
For aid in the selection of Tycol greases best suited for your particular needs, contact your nearest Tide Water Associated office today.

TYCOL
INDUSTRIAL LUBRICANTS

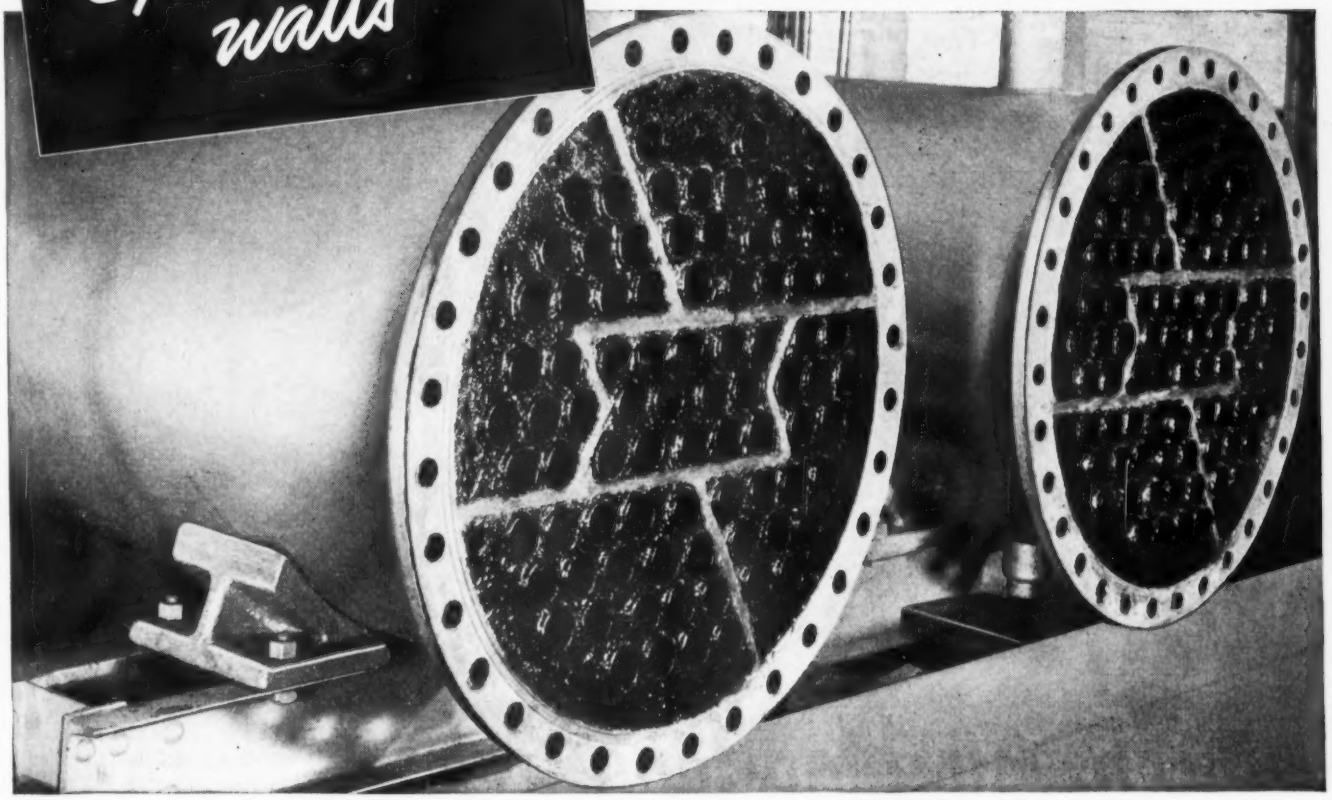
Boston • Charlotte, N. C.
Pittsburgh • Philadelphia

TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE · NEW YORK 4, N. Y.

LUBRICATION—"ENGINEERED TO FIT THE JOB"


Unseen Values
—but a part of every Navco installation
Assured Safety
★
Efficient Operations
★
Minimum Fuel Costs
★
Low Maintenance
★
Long Trouble-Free Life
NAVCO
NAVCO PIPING
NATIONAL VALVE & MANUFACTURING COMPANY • PITTSBURGH, PA.
NEW YORK • CHICAGO • CLEVELAND • BOSTON • ATLANTA • TULSA • BUFFALO • CINCINNATI

"Sprayed-on" walls between metal and water



APEXIOR NUMBER 3 is a durable, protective coating made of 100% asphalts dissolved in a completely volatile solvent. Applied to metal surfaces, it dries to a shiny-black film, impervious to fresh or salt water at all temperatures under 125°F.

In condenser tubes, such as those shown above, or vertical, APEXIOR NUMBER 3 makes cleaning easier, because its chemically inert surface prevents the tight bonding of scale. Walled against all outside contact, the metal surface is completely isolated from corrosive action. New metal is *kept* new — old metal is preserved from further deterioration, even when corrosion has made considerable headway.

To apply APEXIOR NUMBER 3, first clean the surface thoroughly, down to the bare metal, leaving no trace of oil or other moisture. For tube interiors and other hard-to-get-at spots, special spray equipment is supplied; a hand brush is used for accessible areas.

Takes the Wear

Besides its effectiveness in condensers and cooling equipment, the tough, wear-resistant character of APEXIOR NUMBER 3 offers lasting protection in many other instances where rapid cold-water flow occurs — for example, in marine applications such as propeller and rudder areas. Being non-conducting, it counteracts corrosive electrolysis between different metals.

Non-Toxic

APEXIOR NUMBER 3 checks corrosion in all cold-water storage or cooling tanks. It is safe for drinking-water contact, having no toxic effect and imparting no taste to the water.

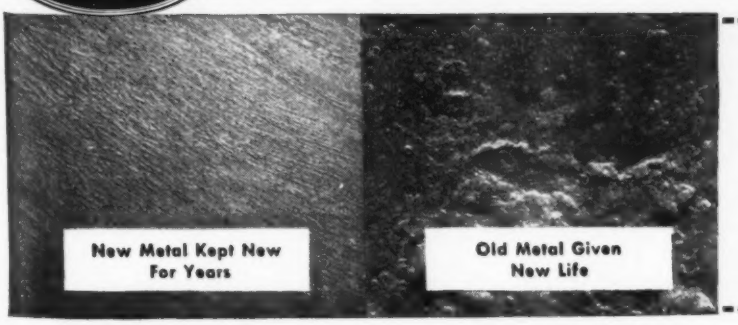
APEXIOR NUMBER 3 offers enduring, economical insurance against corrosion — proved by countless successful applications on land and sea for over a quarter of a century. Your own cold-water handling equipment needs this positive protection for longer life and reduced maintenance . . . the coupon below will bring all the facts. The Dampney Company of America, Hyde Park, Boston 36, Mass.

Two red-heat Dampney coatings are Thur-Ma-Lox Number 7 Black (1600°F.) and Thur-Ma-Lox Number 10 Aluminum (1200°F.). Properly applied, they provide lasting protection to dry metal surfaces subjected to the extreme temperatures indicated.

APEXIOR

Keeps new metal new . . . Gives old metal new life

DAMPNEY



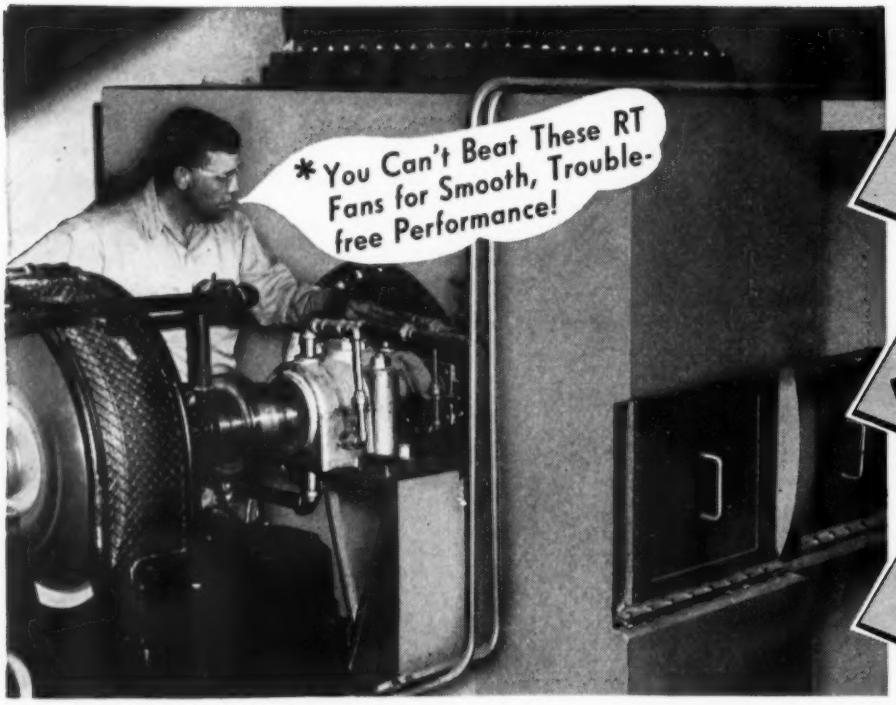
THE DAMPNEY COMPANY OF AMERICA
1261 River Street
Hyde Park, Boston 36, Mass.
Please send free Bulletin 1290

Name.....

Company.....

Address.....

.....



SHAFT - Extra Large

BEARINGS - Extra Large

WHEEL - Extra Heavy

*This RT is operating as an induced draft fan (central station job) handling flue gases at 400° F.

WANTED! — a Chance at Your Tough Air Handling Jobs!

You can push Clarage Type RT Fans to the limit — and not be afraid of costly shutdowns or excessive maintenance.

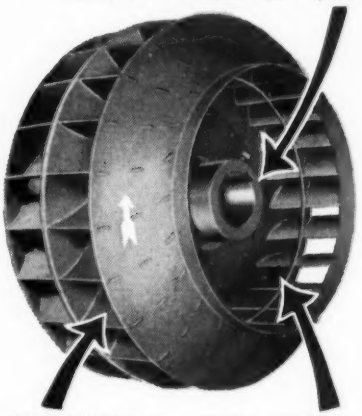
These RTs are designed to take stresses beyond common practice — built to be champions in the heavyweight class. Shaft and bearings are extra large; wheel extra heavy.

Use RT Fans for mechanical draft — especially induced draft. They are modern high-speed type — ideal for direct motor drive. In thousands of central stations and industrial power plants, they are proving their absolute dependability year after year.

However, mechanical draft is not all! Also use Clarage RTs in connection with industrial processes, wherever air must be handled at high temperatures or high pressures, or both — and where the going is not only tough, but too important to let a boy do a man's job. Wide range of sizes to meet a wide range of needs.

May we furnish you with complete data on this extraordinary fan equipment?

The RT wheel hub is cast iron or steel, accurately machined to both sides of center plate. No brace rods required

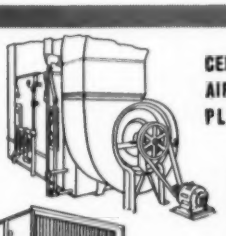


One-piece blades are inserted through slots in center plate and welded in place. The resulting smooth surfaces are far less subject to erosion.

Blades, curved forward at the heel, are held rigidly by means of this heavy reinforcing band. No deflection takes place at high tip speeds.

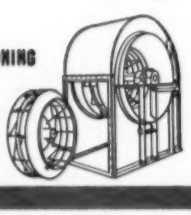
SOME OF OUR OTHER PRODUCTS

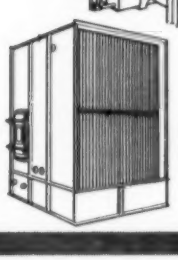
UNIT HEATERS



CENTRAL STATION AIR CONDITIONING PLANTS

AIR CONDITIONING AND VENTILATING FANS





AIR WASHERS

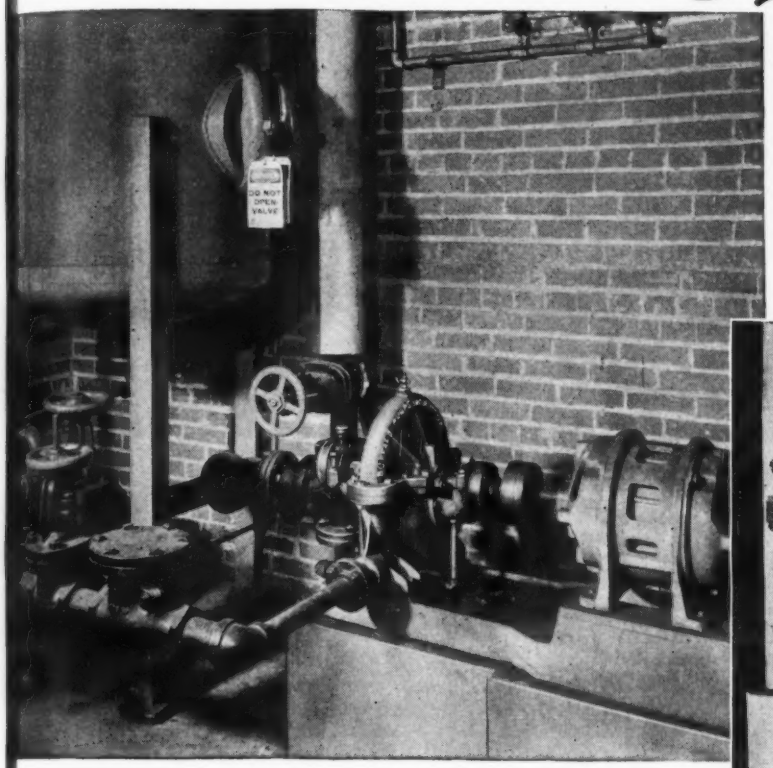
CLARAGE

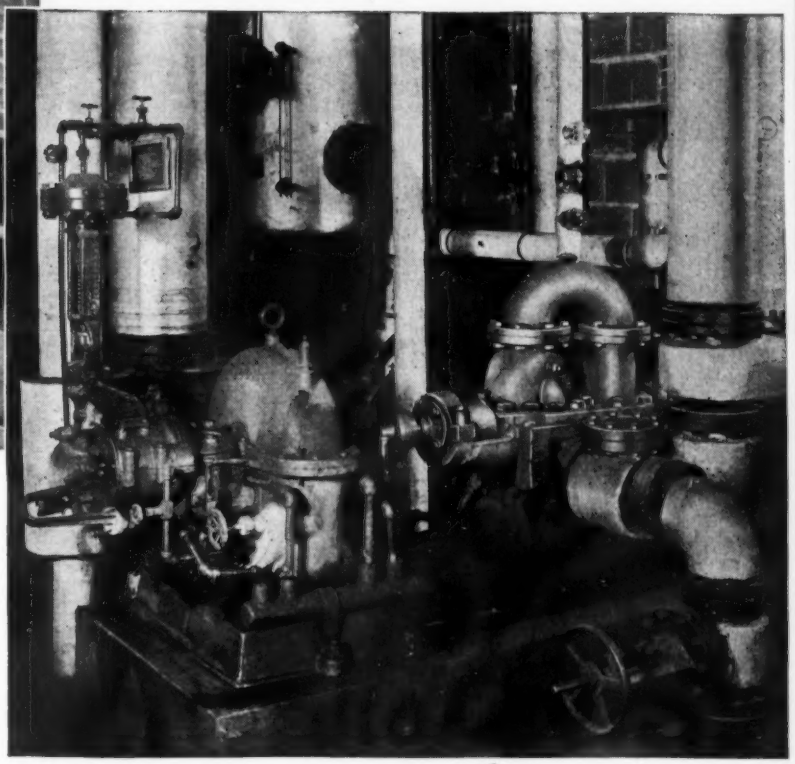
FAN COMPANY

Kalamazoo, Michigan

APPLICATION ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

PUT THESE "Buffalo" PUMPS on your "Paying Roll"





In hundreds of plants these Buffalo pumps are "paying their way" every month. Repair part records show that maintenance costs are amazingly low. Users agree that efficiencies are satisfactory and sustained.

If you specify or buy Pumps — write today for bulletin covering these.

Buffalo Close-Coupled Single Suction Pumps

These husky close-coupled pumps meet the requirements of many chemical plant jobs. Full details on complete line in Bulletin 975-B.

Buffalo Double Ball Bearing Single Suction Pumps

Chemical plant engineers like these enclosed-impeller pumps for high efficiency service. Complete range of sizes and capacities. Bulletin 976-B gives complete information.

BUFFALO PUMPS, INC.

488 Broadway — Buffalo, N. Y.

Canadian Pumps, Ltd., Kitchener, Ont.

"Buffalo"

DEPENDABLE CENTRIFUGAL PUMPS

FOR ALL THESE SERVICES...

Cut away view of a Walseal Tee showing ring of silver brazing alloy and completed Silbraz* joint.

HOT AND COLD WATER circulating systems
BOILER FEED LINES
STEAM RETURN LINES
CONDENSATE LINES
LOW AND HIGH PRESSURE AIR piping systems
LUBRICATING OIL circulating systems where filters and coolers are used.
INDUSTRIAL GAS piping, such as oxygen, nitrogen, argon, helium, etc. throughout laboratories.
SOLVENT PIPING carrying solvent into process and away from process through recovery equipment.
VACUUM PIPING systems.

specify

SILBRAZ ★ JOINTS

MADE WITH WALSEAL* PRODUCTS

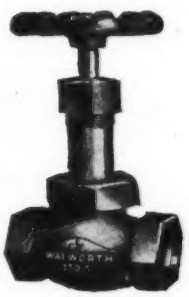
Yes, on tough jobs like these, where brass or copper pipe or copper tubing is used, Walseal bronze valves, fittings, and flanges do a two-fold job.

1. They make leakproof, trouble-free connections that are permanent . . . vibration-proof, corrosion-resistant — connections that will not creep or pull apart; that literally join with the pipe to form a "one-piece pipe line."

2. They eliminate the need for maintenance and costly repairs — especially important where lowered operating costs are imperative.

For these reasons more and more piping installations are being made with the modern Silbraz joints, using Walseal products. For complete details on Walseal products, write for a free copy of Walworth Circular 84.

No. 95WS—150-Pound Bronze Globe Valve with Renewable Disc, Lock-on Disc Holder, and Walseal Ends.



No. 225PWS — 350-Pound Bronze Globe Valve with "500 Brinell" Plug Type Seat and Disc, and Walseal Ends.

Walworth also manufactures a complete line of bronze, iron, and steel valves and fittings. A detailed description of the entire line is included in Catalog 42. Write for your free copy today.

*Patented—Reg. U. S. Pat. Off.

Make it a "one-piece pipe line" with WALSEAL

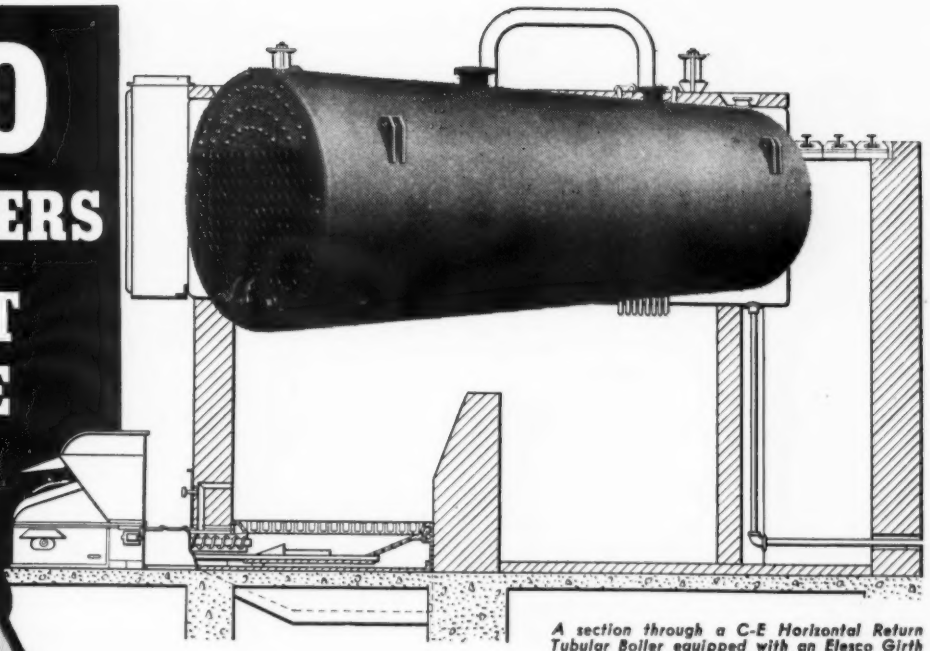
WALWORTH

valves and fittings

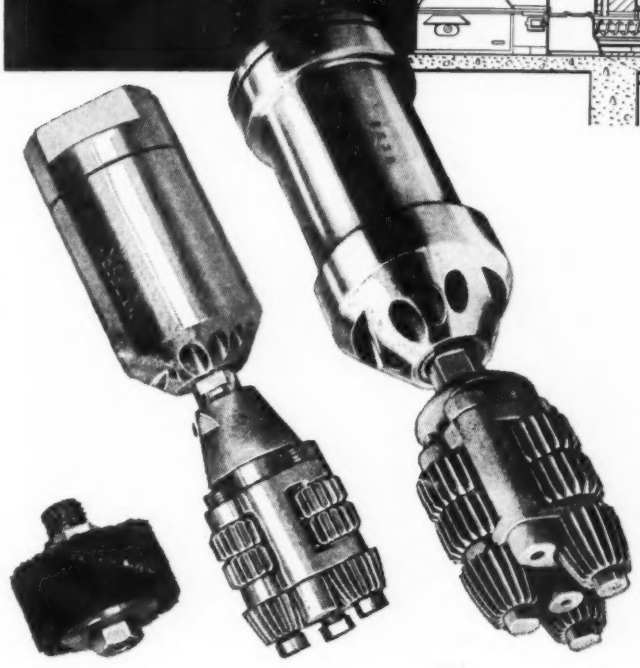
60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

ROTO
TUBE CLEANERS
for C-E HRT FIRE TUBE BOILERS



A section through a C-E Horizontal Return Tubular Boiler equipped with an Elesco Girth Type Superheater and fired by a C-E Skelly Stoker Unit. A photograph of a fusion-welded shell is superimposed on the drawing.



Roto Solid Wire Brush available for tubes from 2½" to 4" ID

Roto Model 130 Air-driven-Motor with swing-frame head.

Roto Model 135 Air-driven Motor with swing-frame head.

C-E Horizontal Return Tubular Boilers are equipped with three sizes of tubes: 3", 3½" and 4". Roto equipment required for cleaning the inside and outside surfaces of these tubes is specified and illustrated, and can be shipped from stock at once.

ROTO TUBE CLEANER SPECIFICATIONS

For 3½" and 4" tubes—

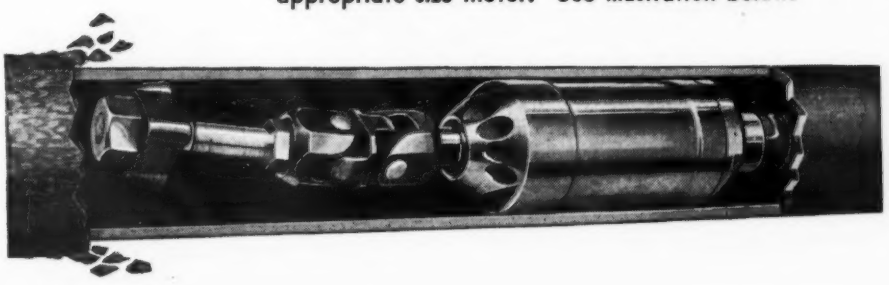
Roto Model 135 Air-driven Motor with swing frame head for hard accumulations inside the tubes. For removing soot or for polishing the tubes, a wire brush with universal joint is used.

For 3" tubes—

Roto Model 130 Air-driven Motor with swing-frame head removes hard deposits inside these tubes, and a wire brush with universal joint is used for polishing or for removing soot.

Water scale may be removed from the outsides of the tubes by attaching a vibrating head and universal joint to the appropriate size motor. See illustration below.

Illustrating how the vibrating head removes water scale from the outside tube surface.



ROTO Division of ELLIOTT COMPANY
145 SUSSEX AVENUE - - - NEWARK 1, N. J.

HOPPES
FEEDWATER HEATERS

Deaerating and Non-Deaerating

Write for Bulletin

THE HOPPES MFG. CO.

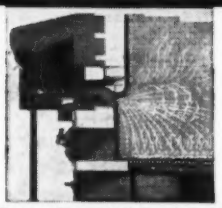
Established 1881

SPRINGFIELD OHIO

FYR-FEEDER
MULTIPLE SPREADER **STOKERS**

Available Now!

FEATURING:



AIR JET COAL PROPULSION

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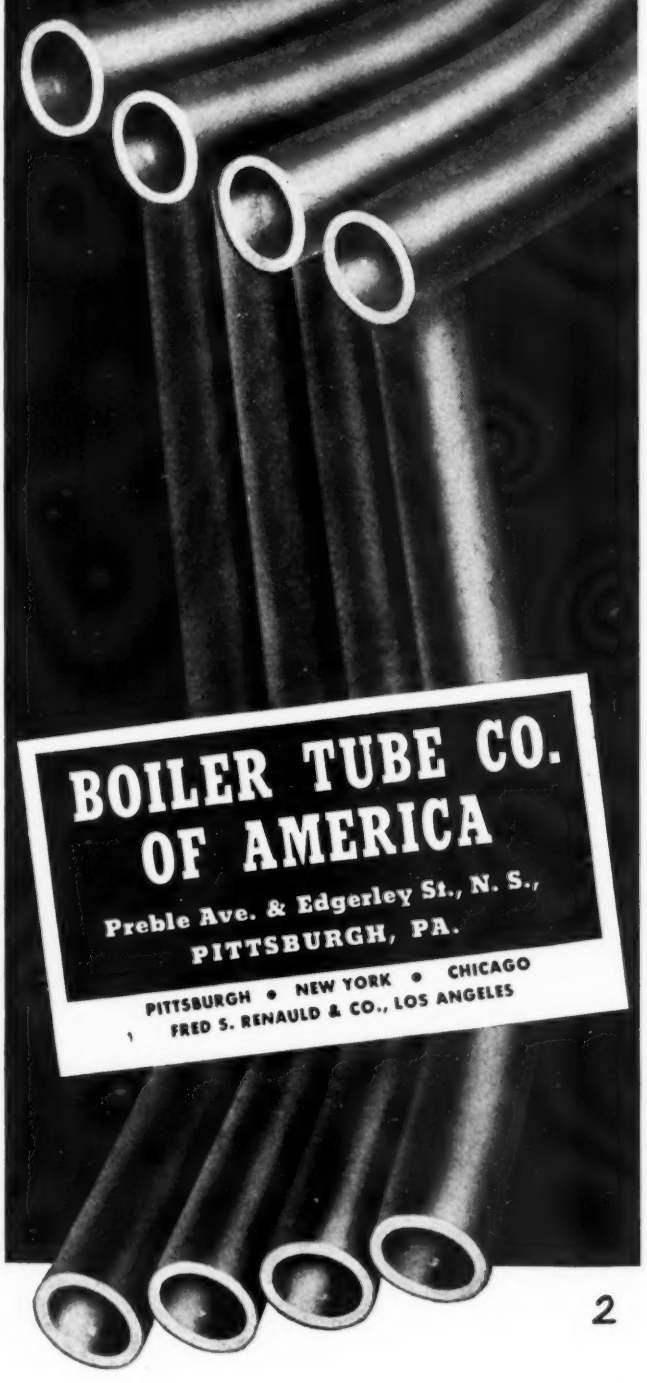

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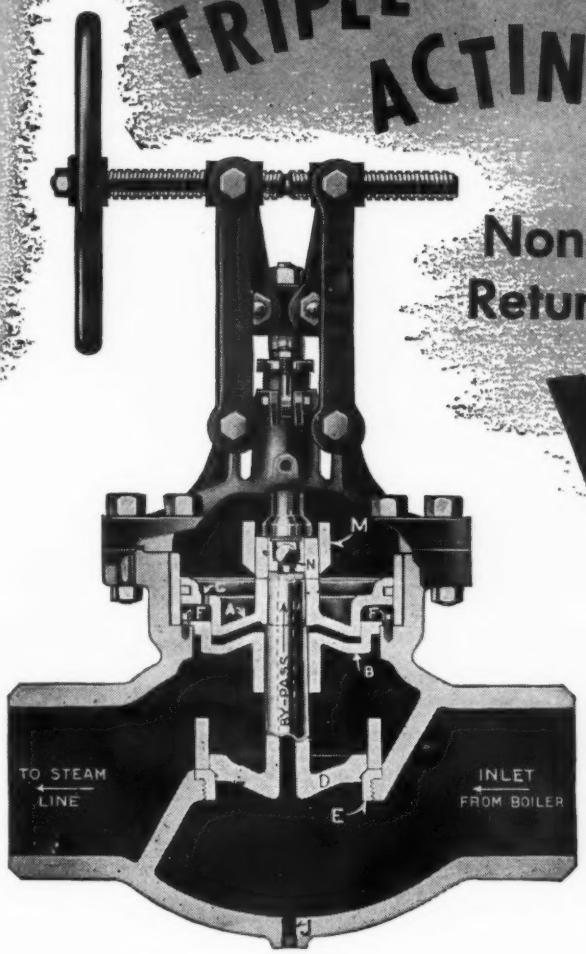
3 Will prevent steam flow from boiler in event of sudden drop in line-header pressure below the boiler pressure.



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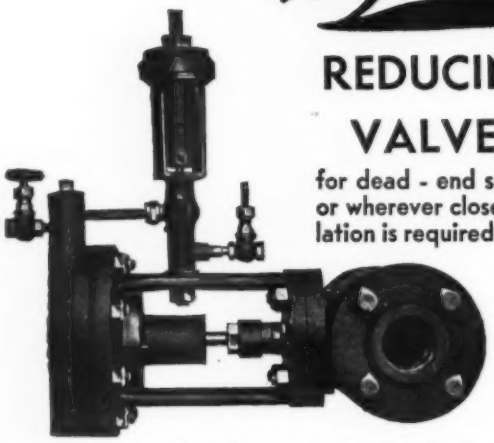

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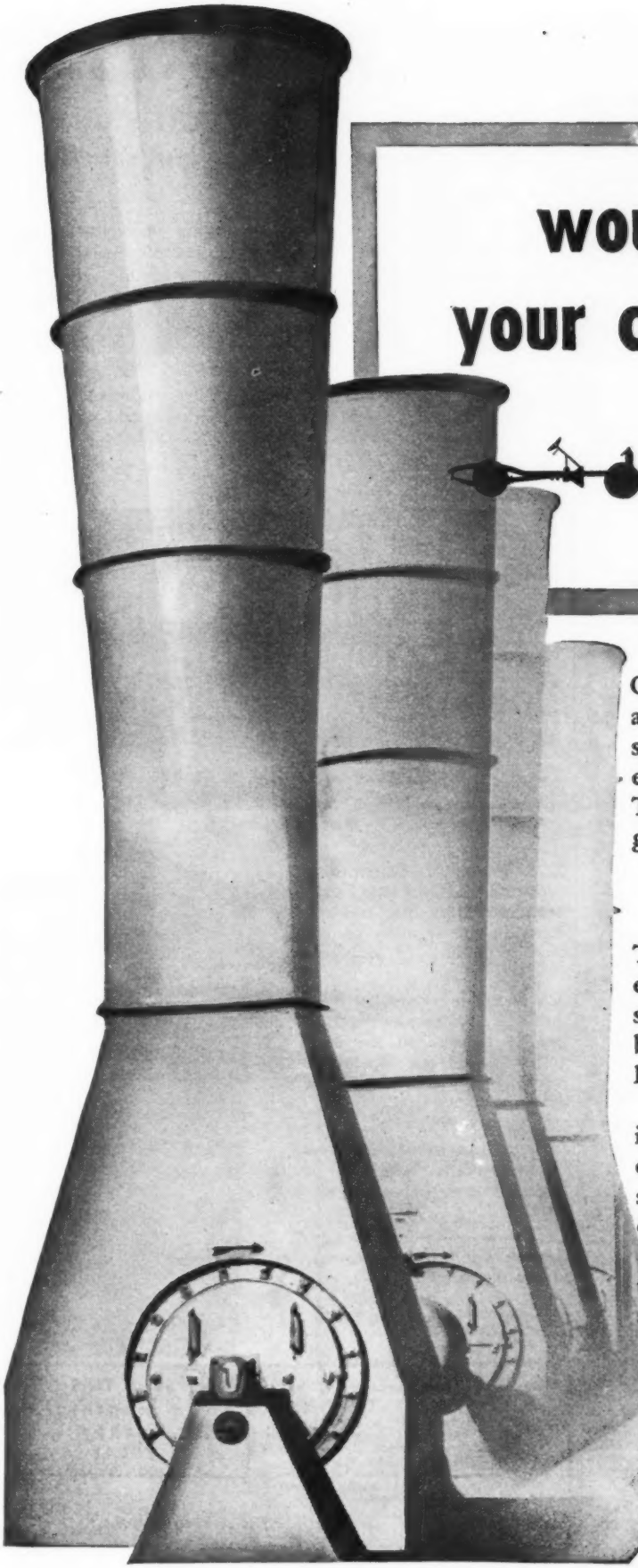

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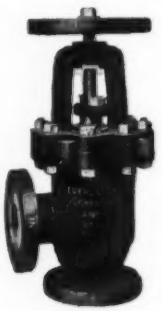

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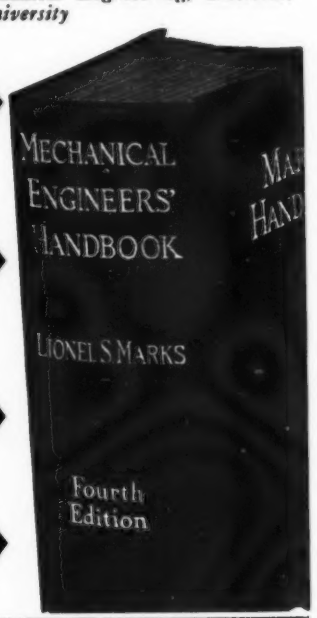

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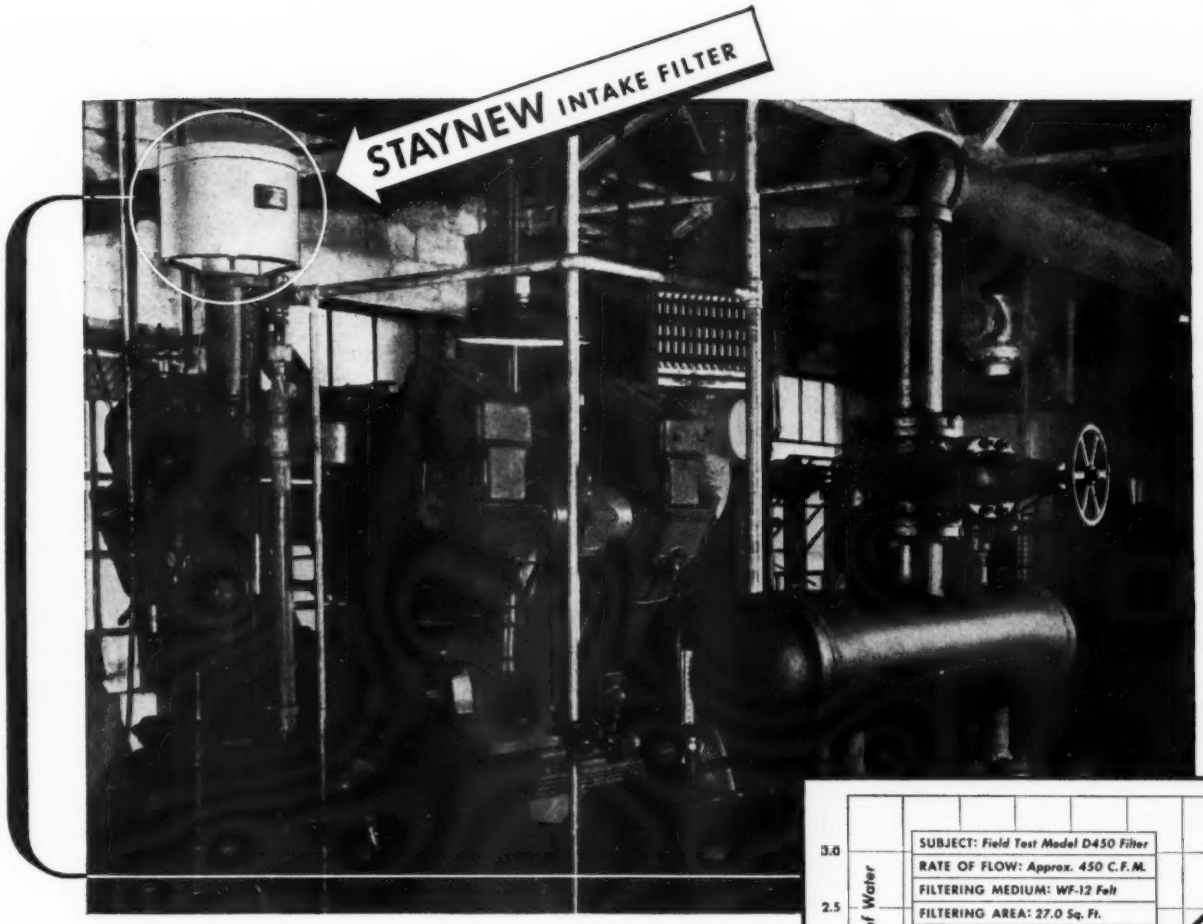

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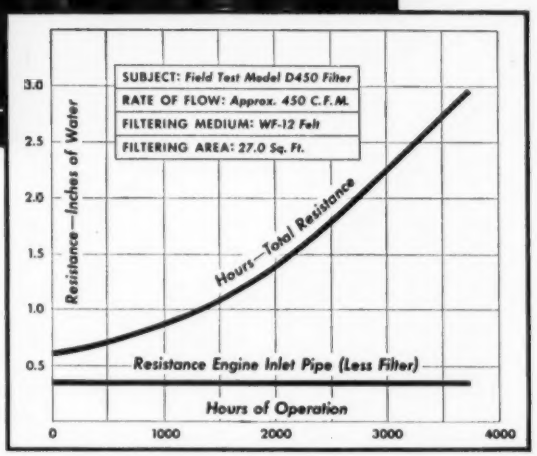

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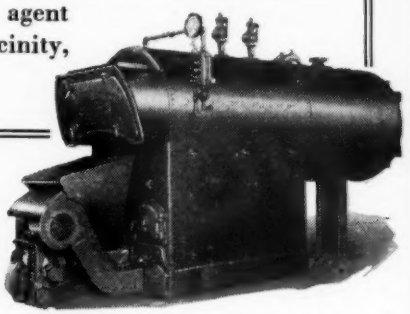

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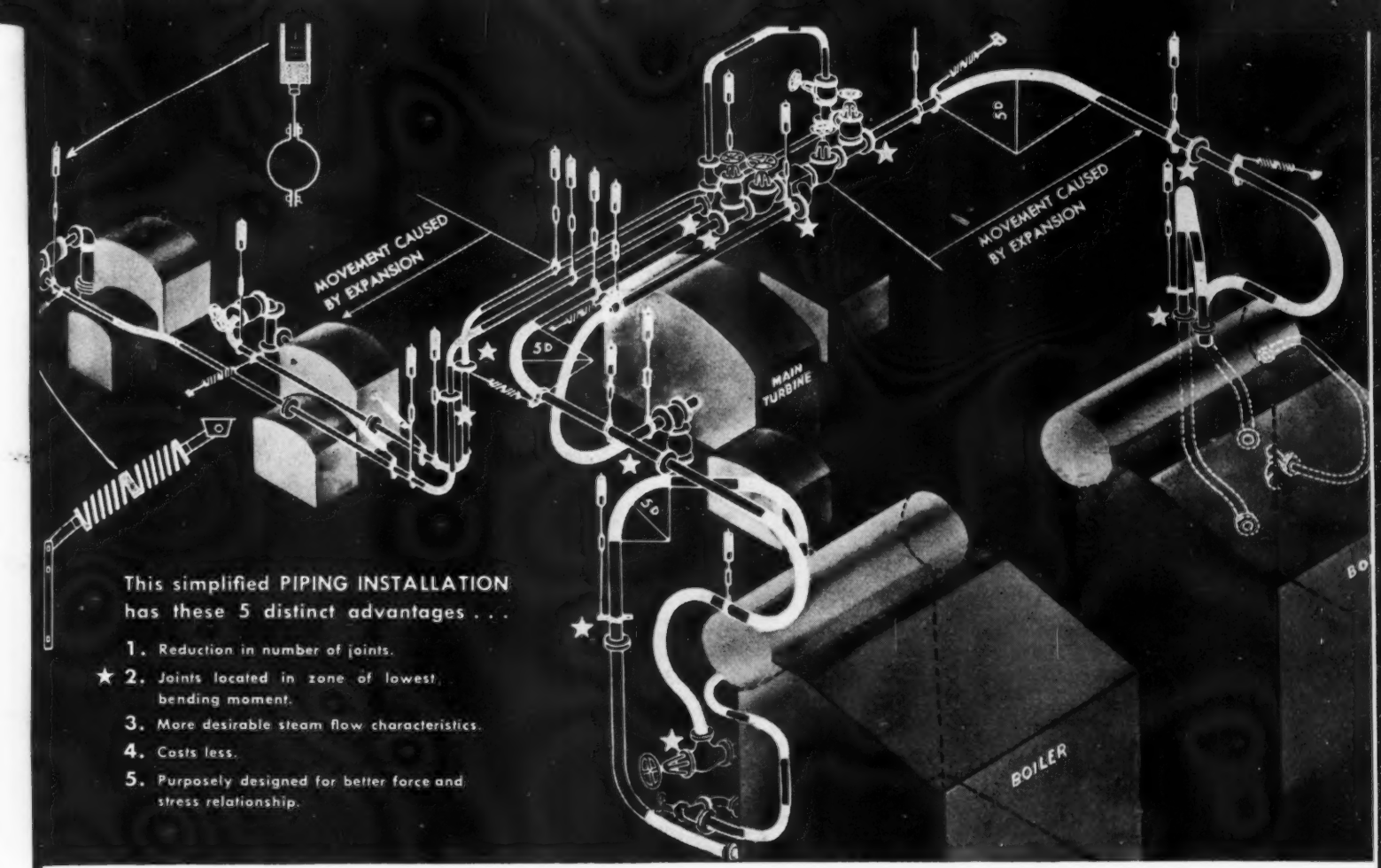

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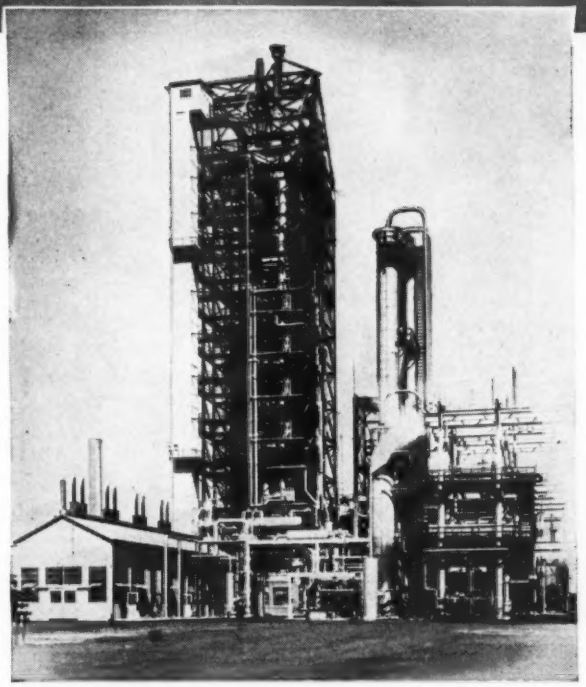

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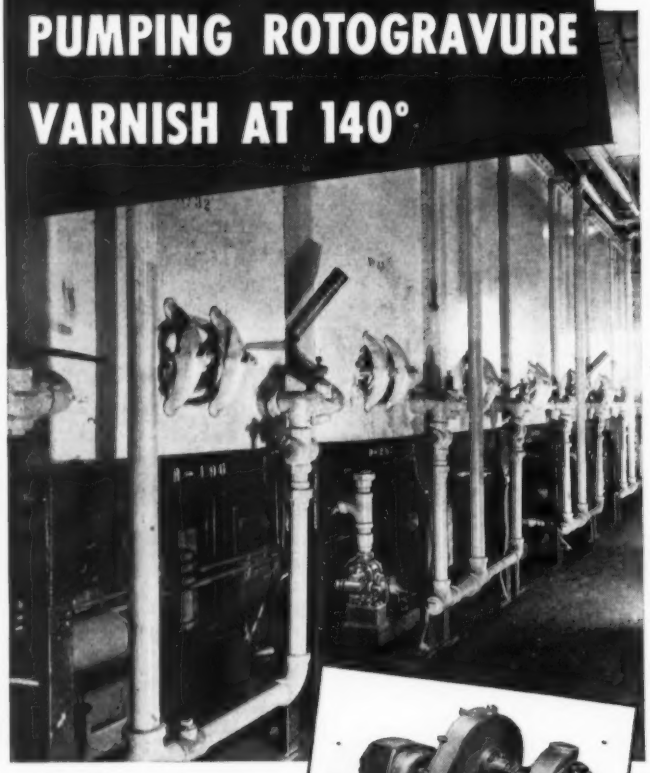

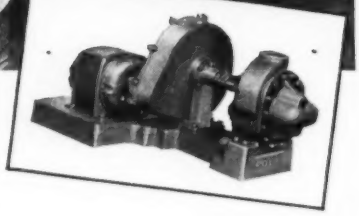

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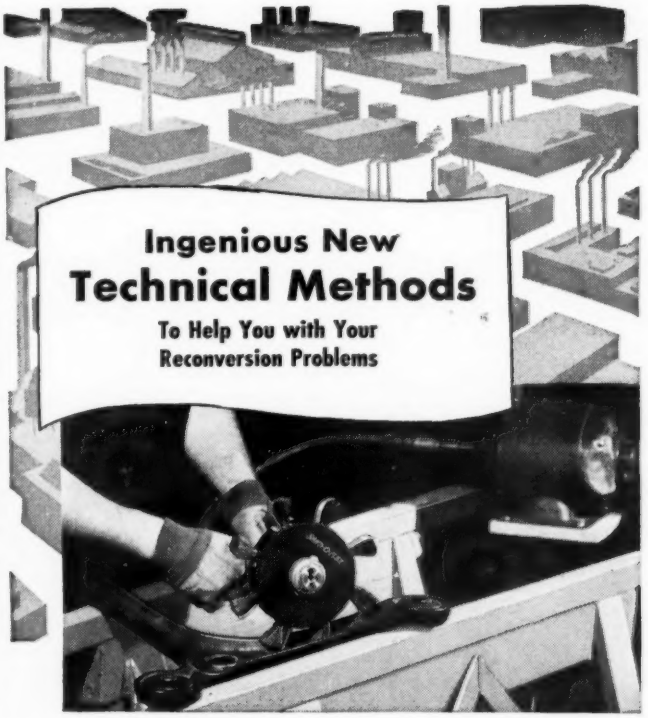

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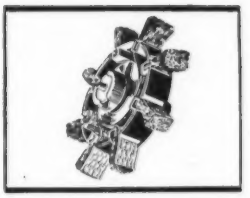

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before steel changed the world's definition of "modern"

Go back three thousand years to the day when an emperor dedicated this street in an ultramodern Chinese city. Architect, engineer, contractor, owner, not one could think of a single additional improvement to make this a more beautiful, more comfortable, more luxurious place in which to live.

Splendid through the ages, in its solid stonework and sweeping tile roofs, street and city have endured until now. But today this place is among the most primitive, most comfortless habitations of civilized man. There is complete lack of sanitation. There are no sewers. Garbage and filth choke the street. The only running water is what trickles down the gutters when it rains. In fact, probably no dweller on this old world street has ever heard of hot and cold running water, piped to bathrooms and lavatories, laundries and kitchens, in the accepted American way!

Why should we in America be so far ahead of the rest of the world in sanitation and cleanliness--typified by our towering hotels with a bath for every room, our skyscrapers with refrigerated drinking water on every floor, our homes with their deluxe accommodations of built-in laundry tubs, automatic washers, porcelain sinks, bathtubs, showers, lavatories?

You know the answer. It's because we can have running water, water pumped through steel pipes. And we have pipes at low cost and in unlimited quantity, because *steel* is so plentiful and so inexpensive. The term "modern" *today* signifies "liberal use of steel." Our task for today and tomorrow is to modernize America and the world, through the wider, more liberal use of steel pipe and the other thousands of steel products.

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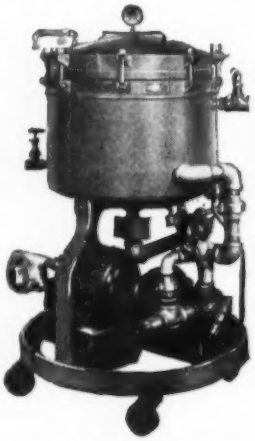

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I come from a large family of problem solvers—the ElectroniK Family. It is traditional in our family to be quick, accurate and sensitive to changing conditions. I am considered not only well balanced, but "Continuous Balance" is my forte—no inching—no nudging—just a smooth, effortless, instantaneous follow-through on temperature changes.

The picture that I have used for this application shows me arrayed as a Precision Indicator, the outfit I use for central reading jobs. But my wardrobe also contains styles for Recording and Controlling—Strip and Circular Chart Recorders—Air and Electric Controllers.

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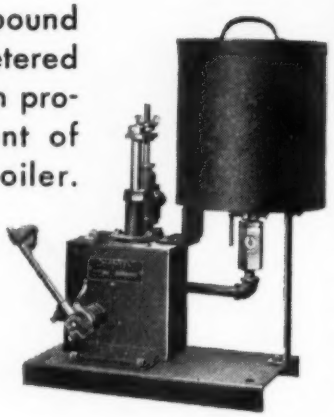

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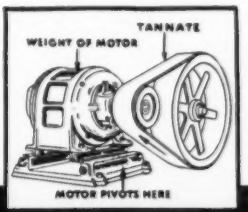

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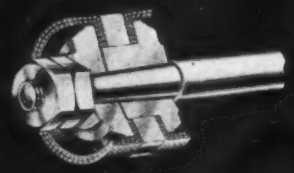

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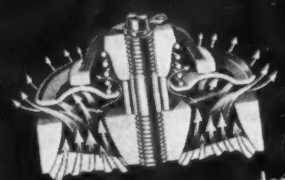

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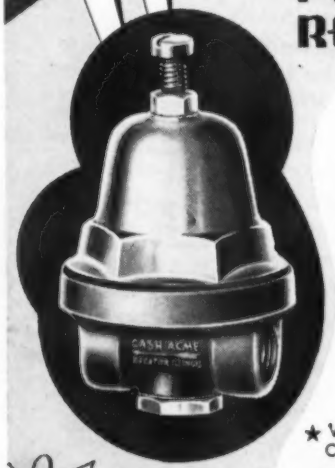

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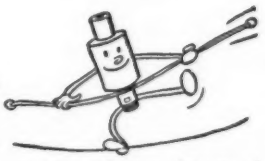

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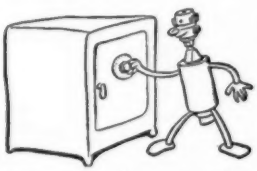

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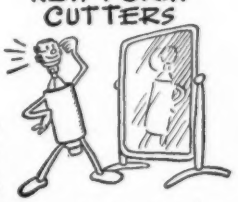

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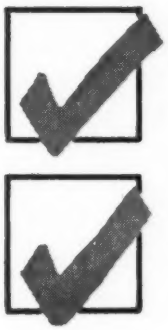

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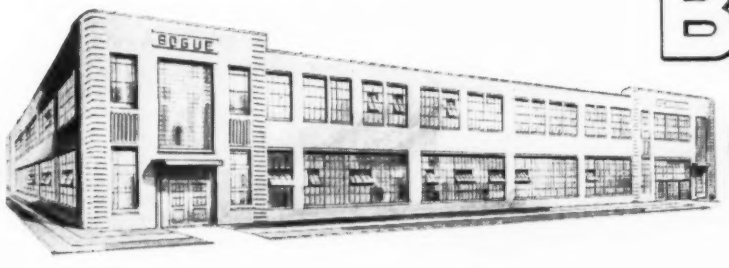

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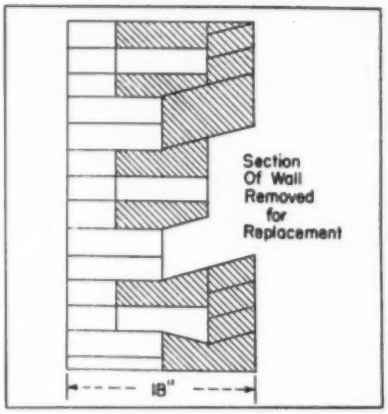

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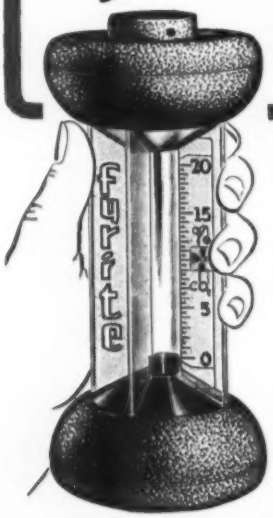

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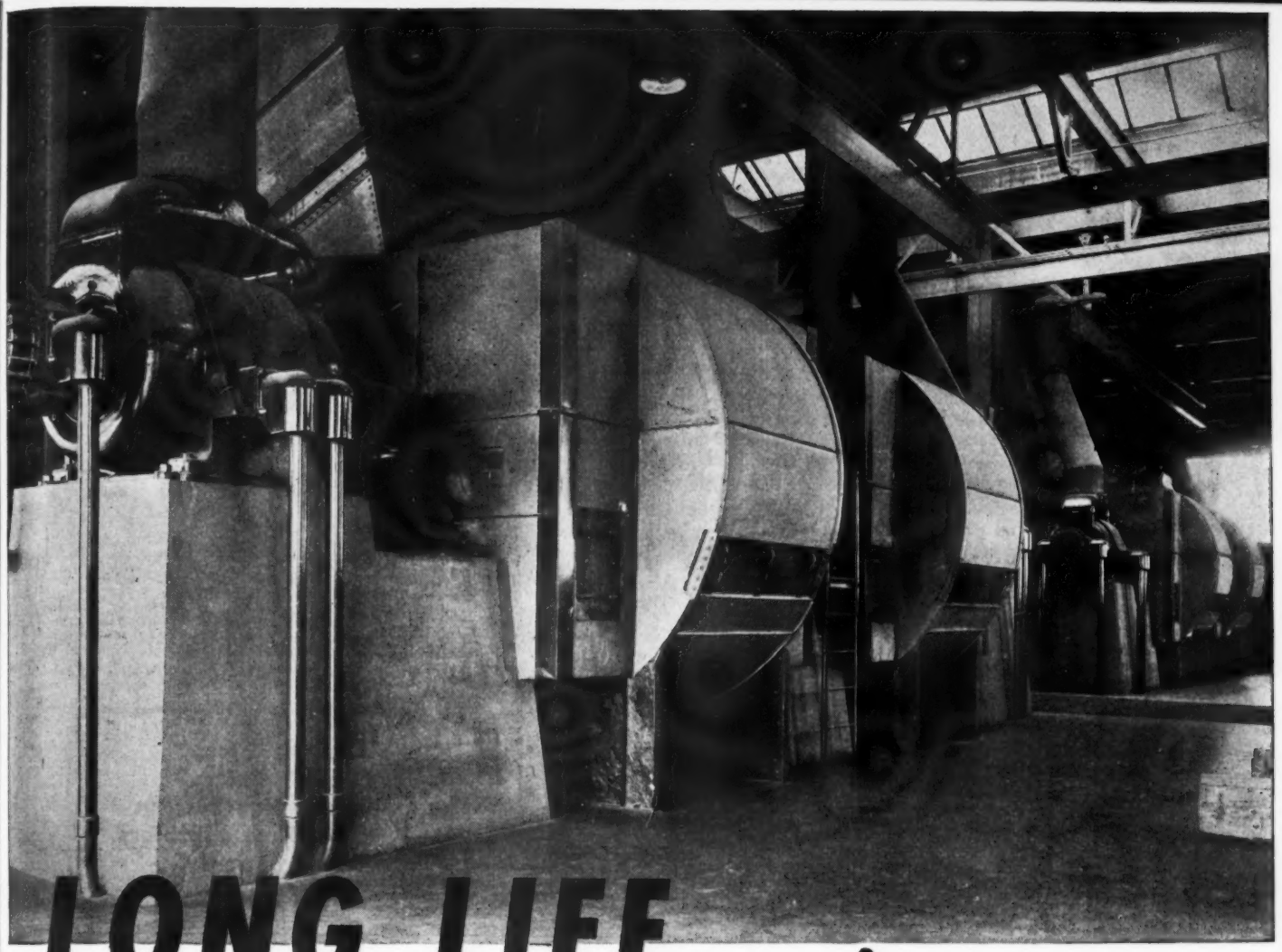

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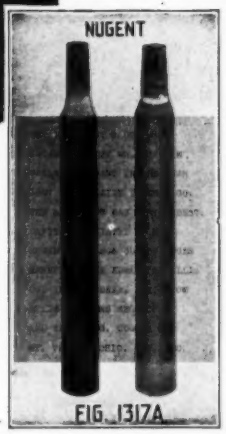
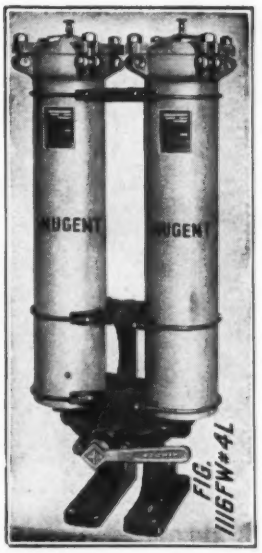




Above left: The dark tube of dirty crankcase oil shown at the extreme left was taken from a 300 HP. gas engine before installing a Nugent Filter. The other tube shows a sample of oil from the same engine after the installation of a Nugent Filter, and operating 1,344 hours before cleaning.

Above right: Nugent Duplex Fuel Oil Filter.

Nugent Filters

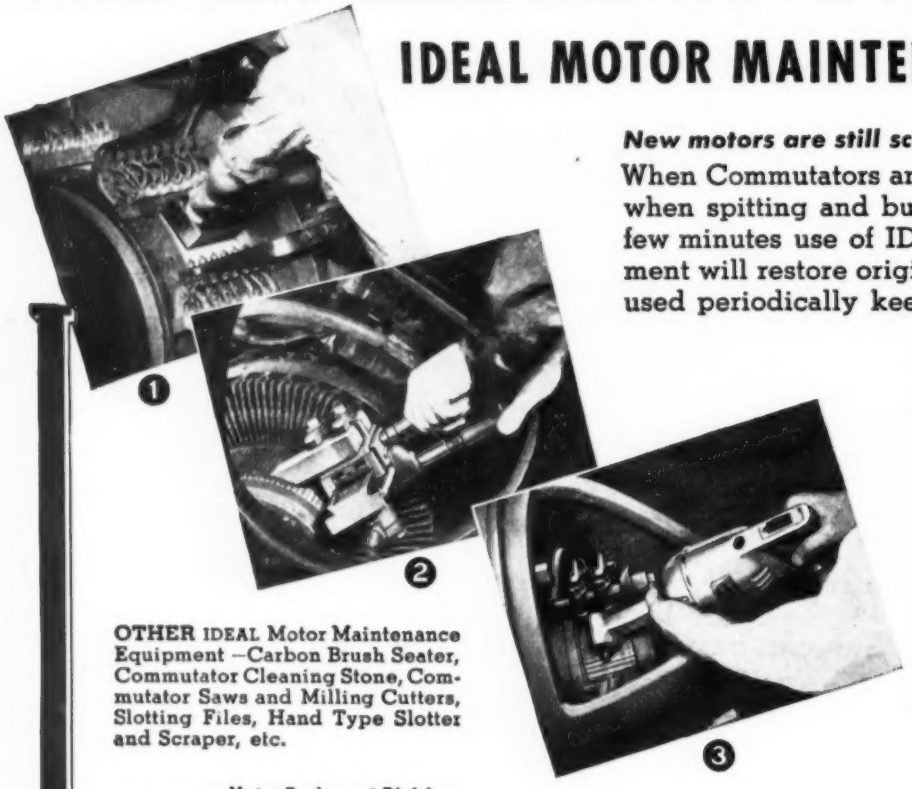
ESTABLISHED 1897

Fuel Oil Filters
Lube Oil Filters
Lubricating Systems
Sight Flow Indicators
Oiling Devices

WM. W. NUGENT & CO., INC.
402 N. Hermitage Ave. Chicago 22, Illinois

Prevent Motor BREAKDOWNS *that cause Plant* SHUTDOWNS!

IDEAL MOTOR MAINTENANCE EQUIPMENT



New motors are still scarce; conserve the ones you have.
When Commutators and Slip Rings show signs of wear, when spitting and burning indicate high mica, etc., a few minutes use of IDEAL Motor Maintenance Equipment will restore original high efficiency. IDEAL Tools used periodically keep Commutators and Slip Rings "good as new" and prevent costly shutdowns.

1 RESURFACERS (Hand Type) Remove pin ridges, roughness and small flat spots from Commutators and Slip Rings, while the armature rotates in its own bearings.

2 PRECISION GRINDERS (with Tool Type Resurfacers) Restore surfaces that are badly scored and out-of-round. Easy to mount right on motor frame. No dismantling necessary.

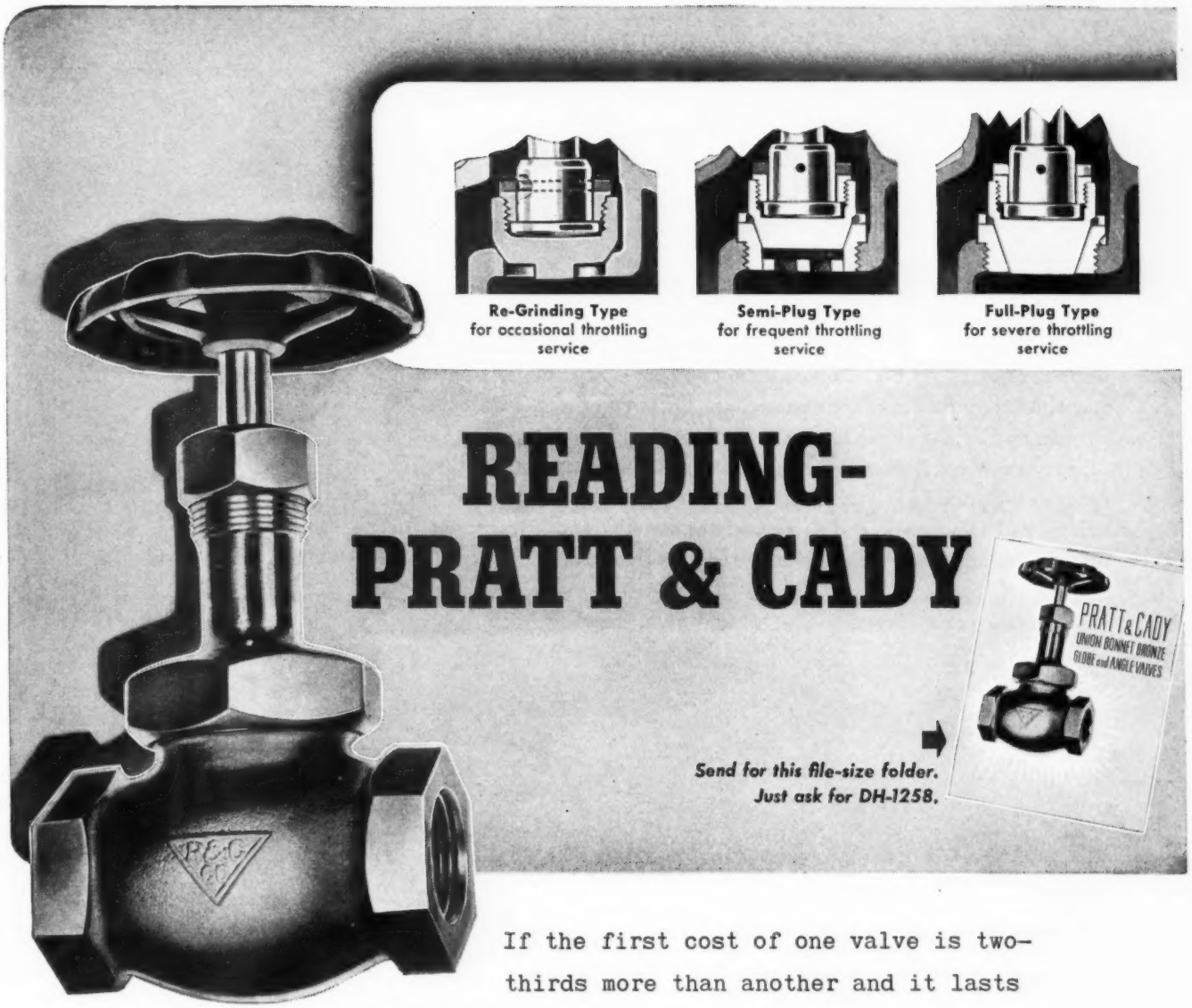
3 MICA UNDERCUTTERS (Power Driven) Undercut hardest mica, without taking down motor or generator.

OTHER IDEAL Motor Maintenance Equipment —Carbon Brush Seater, Commutator Cleaning Stone, Commutator Saws and Milling Cutters, Slotting Files, Hand Type Slotter and Scraper, etc.

Motor Equipment Division
IDEAL INDUSTRIES, Inc. *(Successor to Ideal Commutator Dresser Co.)*
1025 PARK AVENUE SYCAMORE, ILLINOIS

1753

Here's How a Better Valve COSTS LESS



If the first cost of one valve is two-thirds more than another and it lasts eight times as long in the same service – it's a more economical valve to buy. In the long run, it actually costs less.

That is the basis on which Reading–Pratt & Cady offers this superior line of union bonnet bronze globe and angle valves. Reading–Pratt & Cady distributors are located in principal cities.

Reading Cast Steel Valves and Fittings • Pratt & Cady Brass and Iron Valves
d'Este Automatic Regulating Valves

ACCO

Reading, Pa. • Atlanta • Chicago • Denver • Detroit • Houston • Los Angeles • New York • Philadelphia • Pittsburgh • Portland, Ore. • San Francisco • Bridgeport, Conn.

TRADE MARK

READING-PRATT & CADY DIVISION
AMERICAN CHAIN & CABLE

To help increase "Take-Home Savings"

THE Treasury Department has published two new booklets to help you and your employees realize the utmost benefit from your Payroll Savings Plan—benefits proportioned to the extent your employees add to "take home savings" by buying and holding U. S. Savings Bonds.

"Peacetime Payroll Savings Plan" for key executives offers helpful suggestions on the conduct of the Payroll Savings Plan. In addition, it quotes leaders of Industry and Labor and their reasons for supporting the Plan.

"This Time It's For You" is for distribution to employees. It explains graphically how this convenient, easy thrift habit works. It suggest goals to save for and how much to set aside regularly in order to attain their objectives. If you have not received these two booklets, or desire additional quantities, communicate with your State Director of the Treasury Department's Savings Bond Division.

See your Payroll Savings Plan through to maintain your share in America's future. It is sound economics and a powerful force for good today—and tomorrow—as a safeguard for stability and a reserve of future purchasing power—money that is kept within your community.

The Treasury Department acknowledges with appreciation the publication of this message by

POWER

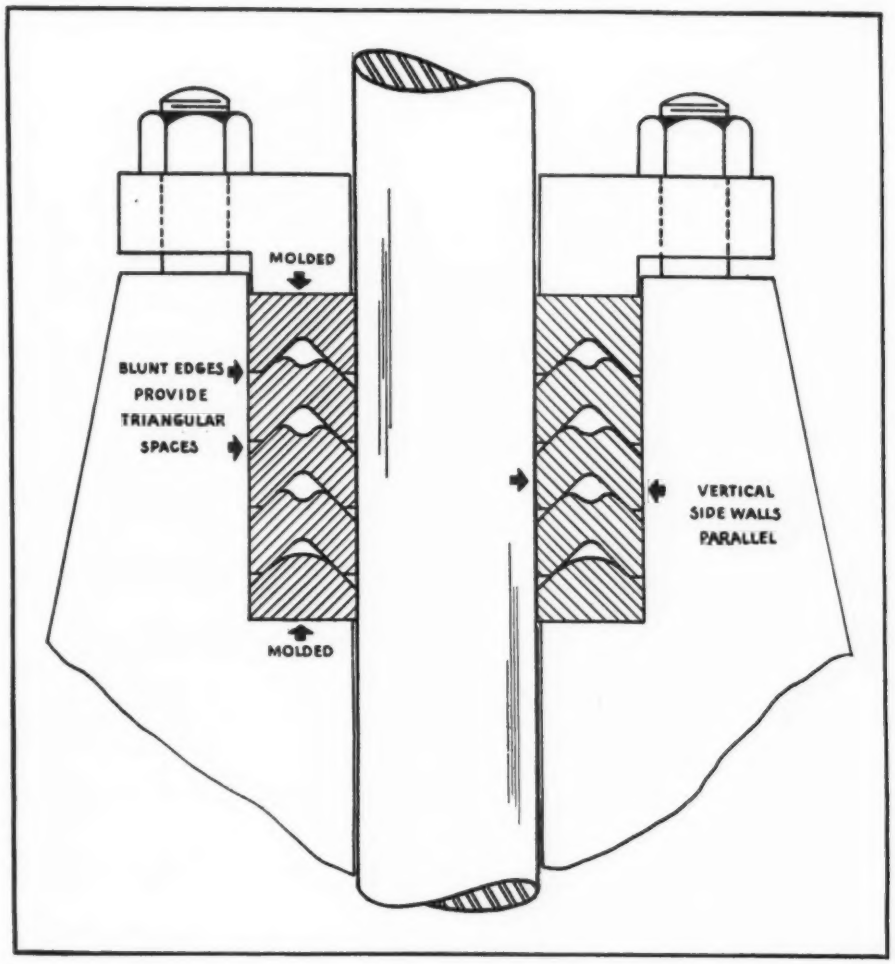
This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and Advertising Council

SERVING YOU THROUGH SCIENCE

Exclusive DESIGN!

U. S. MATCHLESS PACKING for rods and plungers

NO OTHER PACKING HAS ALL THESE ADVANTAGES



BLUNT EDGES—Give more efficient shape; allow fabric to reach end of packing, providing uniform strength throughout. In conventional packing (feather-edge design) fabric cannot be forced into sharp edge, leaving unprotected soft-rubber end to cause curling and chipping.

TRIANGULAR SPACES—Blunt edges provide triangular spaces for trapping loose scale, oil, etc. Result is lower coefficient of friction, less power required, and scaling does not score entire length of packing set.

PRESSURE BREAK—The triangular space of each ring breaks the pressure more quickly than ordinary types without this feature. With "Matchless" design, automatic action is faster, more effective.

MOLDED END RINGS—Tests show the female ring and the one next to it take 70% of the pressure on the set. In "Matchless" *all* rings are molded, are of proper density, and have no sharp edges to break off, as on end rings cut from slab.

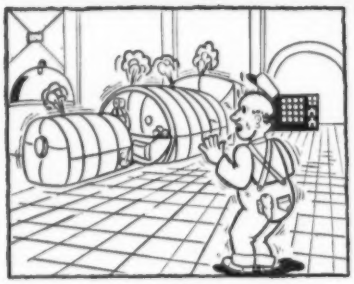
EASY TO INSTALL—Matchless Packing has parallel side walls, while conventional packings are made with varying degrees of wall flare. "Matchless" rings slide easily into stuffing box; the flare type requires considerable effort and time.

For the past twenty-five years "Matchless" has been famous in industry for its unique advantages on hydraulic equipment, presses, rams, triplex pumps, outside packed pumps, and swivels on rotary drilling rigs. The self-adjusting, automatic action of "Matchless" results in reduced wear and tear on rods and plungers, minimizes friction and keeps down packing costs.

UNITED STATES RUBBER COMPANY

1230 AVENUE OF THE AMERICAS • ROCKEFELLER CENTER • NEW YORK 20, N. Y.

METRON *Overspeed Tachometer*



for Accurate (1/4%)
Overspeed Testing of TURBINES and GENERATORS

Double Range: 1700 to 2200 RPM; 3400 to 4400 RPM.
For 1800 and 3600 RPM Machines.
Other Ranges Available.

YOU know . . . that accurate over-speed trip-out setting is important.

But did you realize . . . that an error of only 1 or 2 percent can endanger your turbine or cause needless trip-outs, and that an ordinary tachometer is not reliable enough for over-speed testing?

The Metron Over-speed tachometer is designed for this specific use.

Accurate - Sensitive - Stable - Easy to Use
Send for Illustrated Folder, Specifications, Price

METRON INSTRUMENT CO.
432 Lincoln St. Denver 9, Colo.

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Industrial Waste Burners

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BRANCHES: BOSTON
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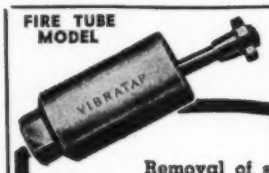

SAVE COAL

Removal of scale from boiler tubes always saves coal. Use a VIBRATAP TUBE CLEANER for a thorough removal of incrustation. Write for Bulletin V-20.

BRUNT EQUIPMENT CO.
60 S. DIVISION ST. · BUFFALO, N. Y.

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Tripp Metallic Packing
TRIPP METALLIC PACKING CO.
BOSTON MASS.

TEST SPEEDS and SAVE at a glance
REVOLUTIONS and FEET per min.
SPEED VARIATIONS
BELT SLIPPAGE
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5-RANGE CENTRIFUGAL
ROTARY
GEAR
SHIFT
4 Models:
30-48,000 RPM
Bulletin 8889

COATS MACHINE TOOL COMPANY, INC.
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POWERS TEMPERATURE PRESSURE and HUMIDITY CONTROL

For Industrial Processes, Heating and Air Conditioning Systems, Hot Water Heaters and Shower Baths. Write for Bulletins.
Offices in 47 Cities
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THE POWERS REGULATOR CO.

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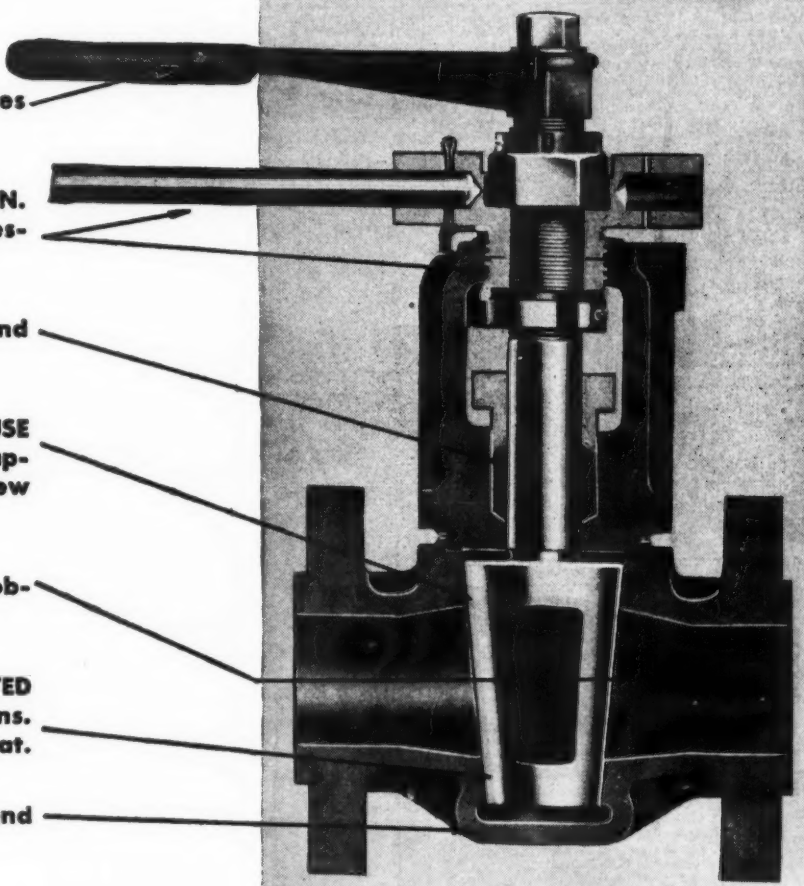
BOILER BAFFLES
HIGH TEMPERATURE
Refractory Cements
SANFORD C. SMITH REFRACTORIES, INC.
1715 NIAGARA ST., BUFFALO, N. Y.

Homestead Lever-Seald Valves

Proved for over 15 Years

in Services from 40° below zero to 1120° Fahrenheit



A QUARTER-TURN fully opens or closes valve.

INSTANT STICKPROOF OPERATION. Plug turns freely after seating pressure is relieved by screw lever.

LEAK PROOF. Deep stuffing box and gland prevent leakage.

POSITIVE LEAKLESS SEAL WITHOUT USE OF LUBRICANT is obtained by reapplying full seating pressure with screw lever after opening or closing.

STRAIGHT-LINE FLUID FLOW. No obstructions to cause pressure drop.

SEATING SURFACES ALWAYS PROTECTED in both open and closed positions. Fluid or grit cannot damage valve seat.

SEALED BOTTOM prevents fluid loss and reduces hazards.

For more than 15 years America's leading chemical plants, oil refineries, paper manufacturers, textile mills and steel companies have been using HOMESTEAD LEVER-SEALD VALVES to solve their operating difficulties in services where temperature extremes, pressures, and the corrosive action of line fluids would make ordinary valves stick or seize. Due to their exclusive lever-seald construction, HOMESTEAD LEVER-SEALD VALVES operate freely and effectively at temperatures as low as 40° below zero or as high as 1120°.

Consult, without obligation, our engineers regarding the application of HOMESTEAD LEVER-SEALD VALVES to your problems. Or write for Valve Reference Book No. 38 which shows standard Lever-Seald Valves in sizes from $1\frac{1}{2}$" to 10" for pressures from 150 to 1500 lbs., cast in metals matched to service conditions.

Homestead Valve Manufacturing Co.

P. O. BOX · CORAOPOLIS, PA.

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Complete plant and power maintenance, rehabilitation, installation, construction, inspection, performance and efficiency supervision.—Emergency repairs. High pressure power units a specialty.
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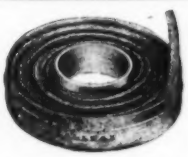
Can Money Be Saved in Your Plant?
The specialists whose professional cards appear in this Directory, can answer that question —*are* answering it continually for other power men.

THE PACKING for EVERY PURPOSE



Stops Leaks · Prevents Scoring

ALLPAX

This universal packing — consisting of long, tough fibrous asbestos fibres, thin flakes of anti-friction metal, minute graphite scales and a heat-proof lubricant — is recommended for general service against steam, water, air, ammonia, oils, gases, etc. where temperatures do not exceed 600°F. Fits all sizes and shapes of stuffing boxes. Special styles available for high temperature and corrosive liquids, for products, etc. Try it and you'll use it regularly.

Distributors everywhere

THE ALLPAX CO., INC., MAMARONECK, N. Y.

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A Special Section on

GAS TURBINES

FOR THE PEAK OF BOILER EFFICIENCY

FLUEKLEEN

Soot and Fire Scale Removing Compound

Eliminates the necessity of shutting down equipment to bring about thorough removal of soot and fire scale. Prevents further formation. Penetrates into parts which cannot be reached by mechanical or manual means.

DRY PINK

Boiler Feedwater Treatment

For steam generators of all types — high and low pressure boilers. Individually prepared after complete analysis of your boiler feedwater is made. Eliminates rust, pitting, corrosion and priming.

RUSTOFF

Rust Treatment

Loosens and disintegrates rust in hot and cold water supply systems. At the same time forms a protective coating on the clean metal which thoroughly protects it against corrosive action.

NO-SLUDGE

Fuel Oil Efficiency Treatment

Keeps the fuel oil in proper suspension. Assures a clean steady flow of oil. Prevents the sludge from forming in the bottom of the tank where the best part of the "B.T.U.'s" settle.

DOMINION CHEMICAL CO., INC.

WATER CONSULTANTS AND CHEMISTS FOR INDUSTRIAL AMERICA

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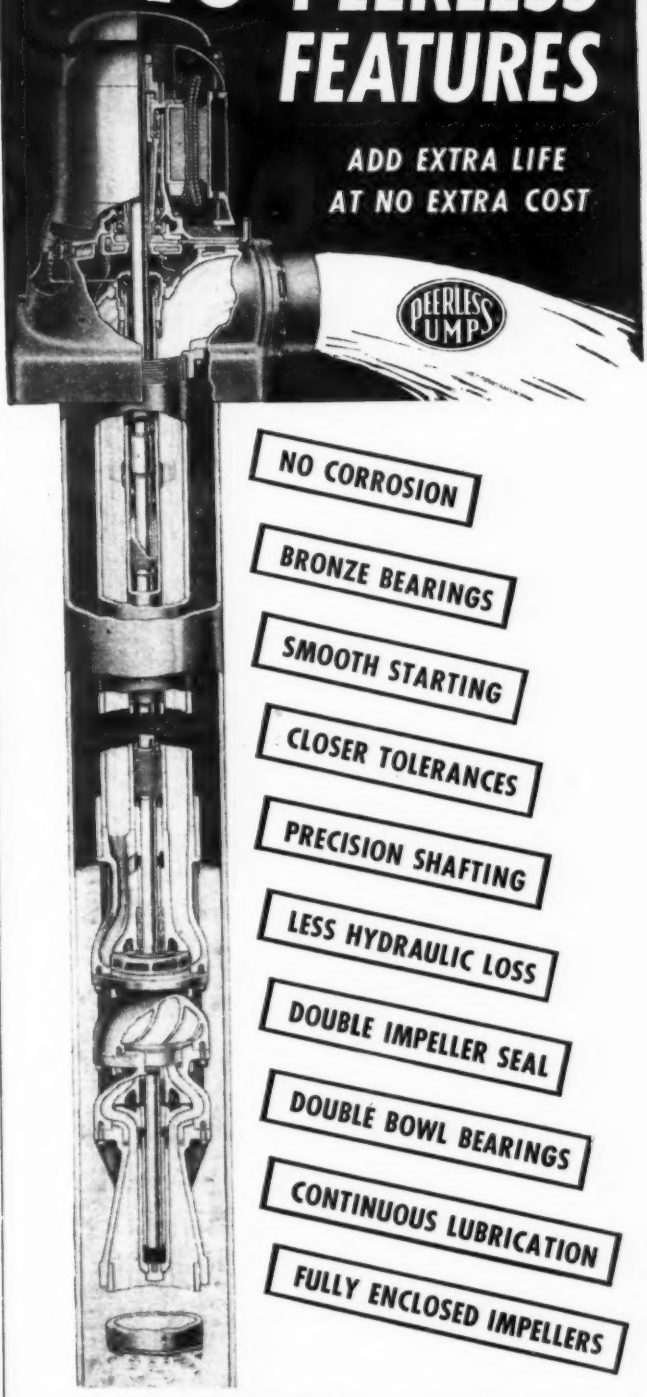
ADD EXTRA LIFE AT NO EXTRA COST



Peerless OIL-LUBRICATED Vertical Turbine Pumps produce up to 30,000 g.p.m., from wells 4" in diameter and larger. Also available with water lubrication.

PEERLESS PUMPS

PEERLESS PUMP DIVISION
Food Machinery Corp.

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To help you keep your plant running at top efficiency, to eliminate waste and to aid maintenance, POWER offers these reprints, designed for quick reading by the power engineer:

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Gives concise data on electric-power distribution systems for industrial plants, equipment used, how to figure conductor sizes for ac and dc feeders, etc. Price 15c

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6/46

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ELECTRICAL ENGINEER

For Power Plant Design
Must have Public Utility Experience

WESTCOTT & MAPES, INC.
New Haven, Connecticut

POSITIONS VACANT

LARGE INDUSTRIAL Concern has opening for graduate engineer under 36 years of age who is experienced in Construction & Mechanical Engineering. Excellent opportunity for right man to advance. Must be willing to travel and supervise construction and machinery installation at various company properties. Give qualifications, experience and photo. All communications will be answered and held in confidence. P-132, Power, 330 W. 42nd St., New York 18, N. Y.

POWER PLANT Engineering and construction company located in midwestern city have an opening for a competent power plant engineer having specific experience with high pressure piping design and detailing and with general power plant construction practice. Excellent opportunity for competent man who is willing to apply himself. Man should preferably be technical graduate with specific experience in this field. Good salary will be paid. Employment permanent. Please send detailed description of education and experience. Expenses for personal interview will be paid. P-134, Power, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: MECHANICAL Designers with experience in power plant design and capable of checking high pressure piping and other plant layouts. Give complete information in first letter. Engineering Department—The United Light and Railways Service Company, Davenport, Iowa.

WANTED: MECHANICAL Draftsmen with experience in power plant design. Give age, education and past experience. Engineering Department—The United Light and Railways Service Company, Davenport, Iowa.

WANTED: GRADUATE electrical or mechanical engineer, preferably ex-navy engineering officer. Good opportunity in Wisconsin Paper Mill. Please give full information in reply. P-144, Power, 520 N. Michigan Ave., Chicago 11, Ill.

POSITION AS Assistant power plant superintendent open in expanding pulp and paper operation in South. Qualifications: Around 35 years of age, graduate in mechanical and electrical engineering with supervisory experience in power plant. Prefer Southerner or person who has lived in South for considerable length of time. Give age, marital status, educational background, experience and other pertinent information in first letter. All inquiries will be held confidential. P-145, Power, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITY OFFERED

MANUFACTURERS REPRESENTATIVE: wanted to sell industrial stokers in the East and South. Must have experience around boilers and settings and be able to travel over territory agreed upon. RW-149, Power, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of 36 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated, through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 270 Dun Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

TECHNICAL COPYWRITER: Experienced in research, reports, booklets, catalogs, advertising in all its phases. Technical articles written and abstracted. Translation from German. Permanent or part time. "Mechanical Engineer". PW-146, Power, 330 W. 42nd St., New York 18, N. Y.

(Additional Positions Wanted & Selling Opportunity ads on page 344)

SEARCHLIGHT SECTION

(Classified Advertising)

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BUSINESS : : USED OR RESALE

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15 CENTS A WORD, MINIMUM CHARGE $3.00
Positions Wanted (full or part time salaried employment only), ½ the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display of advertisements.
This advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENTS received by June 11 will appear in the July issue, subject to limitations of space available. P

WANTED

MECHANICAL ENGINEER
FOR STEAM POWER PLANT DESIGN

An unusual opportunity for a young engineer well grounded in steam power plant design to join a growing organization

WESTCOTT & MAPES, INC.
NEW HAVEN, CONNECTICUT

WANTED

Position of assistant power plant superintendent open in large woodworking plant near Chicago. Requires good working knowledge of steam and electricity generation, power plant maintenance, water softening and experience in power plant supervision.

Give all pertinent information in first letter. All inquiries will be held confidential.

The Singer Manufacturing Co.
2115 Western Avenue
South Bend, Indiana

Turf Development Board, Ltd.

Technical Development Supervisor

Applications are invited from Engineers, Physicists, and Chemists of distinction for a post involving the organization and supervision of a Technical Development Section which the Board proposes to institute.

Candidates for the post must possess technical qualifications of a high order, and experience in the supervision and control of technical staff and in the practical application of science to industry.

The new Section wil have among its aims:

(1) The improvement of existing mechanical devices for the drainage of bogs and the winning and utilization of turf (peat), and the introduction of better methods for carrying out these objects.
(2) The study of chemical and physical problems associated with the dehydration of turf (peat).
(3) Examination of the stratigraphy of bogs.
(4) Examination of the chemical and physical nature of turf (peat).

The salary which will attach to the post will be commensurate with the experience and qualifications of the successful candidate but will not be less than £1,000 per annum.

Applications giving full details of age, qualifications and experience should be addressed to the Secretary, Turf Development Board, Ltd., 21 Fitzwilliam Square, Dublin, Ireland, and must be received not later than June 15th, 1946.

WANTED

STEAM POWER PLANT ENGINEER

One of the nation's largest engineering firms needs man under 35 to understudy project manager at home office in Pennsylvania. At least 10 years experience with a major engineering firm and best references required. Must be able to design and estimate steam power plants, contact and negotiate with customers. Starting salary up to $500 monthly for properly qualified engineer. Address

P-140 Power
330 West 42nd St., New York 18, N. Y.

WANTED

STRUCTURAL ENGINEER
FOR DESIGN OF STRUCTURAL STEEL AND REINFORCED CONCRETE STRUCTURES

An unusual opportunity for a young man experienced in the design of structural steel and reinforced concrete to join a growing organization.

WESTCOTT & MAPES, INC.
NEW HAVEN, CONNECTICUT

Long Established Reputable Concern with Substantial Capital

WILL BUY FOR CASH

Assets, Capital Stock, Family Holdings of

INDUSTRIAL PLANTS, MFG. DIVISIONS, UNITS

Among other considerations, you may realize certain desirable tax advantages

We are principals and act only in strictest confidence, retaining personnel wherever possible. Address

Box 1222, 1474 Broadway, New York (18), N. Y.

POSITIONS WANTED

(Continued from page 343)

POWER ENGINEER: Four years machinery and boiler inspection, licensed inspector and engineer. 10 years experience, power plant and plant maintenance. PW-147, Power, 520 N. Michigan Ave., Chicago 11, Ill.

POWER SUPERVISOR: ten years experience on auxiliary equipment including feedwater and fuel chemist. Sewage disposal; trade waste treatment; substations, pumping stations, refrigeration, recirculation and hydraulic systems, primary and secondary compressors, etc. College grad, highest recommendations. Salary 325 minimum. PW-148, Power, 520 N. Michigan Ave., Chicago 11, Ill.

Is Your Product or Process Represented in Philadelphia and Eastern Seaboard Area?

Manufacturers' Agent, graduate Mechanical Engineer with technical experience, operating own sales office, well established in Phila. for 15 years, continuing 20 year association with one company, contacting Architects, Engineers and Contractors, desires additional products and processes for highly successful Sales Agency.

RA-142 Power
330 West 42nd St., New York, N. Y.

WANTED
EQUIPMENT ACCOUNT
Established manufacturer's agent, Philadelphia, having contacts with mills, mines, refineries, chemical plants and other industrial activities is in position to handle an additional line of mechanical equipment.
RA-141, Power
330 West 42nd St., New York 18, N. Y.

Wanted
ADDITIONAL LINE
Connecticut Engineering Sales Organization operating over twenty years seeks additional line power plant and factory equipment.
RA-127, Power
330 West 42nd St., New York 18, N. Y.

FOR SALE
CHUSE UNIFLOW
POPPER VALVE ENGINE
Cylinders 28"x32" 150 Revolutions Shop No. 1575—condensing or non condensing, worthing jet condenser, steam receiver sufficient in size to take care of steam engine. Generator size 2300 volts, 600 KW (General Electric) Exciter direct connected to Generator.
Will sell for $7,500.00 on foundation
CITY OF HIGHLAND
Highland, Illinois

FOR SALE
WATERWHEEL AND GENERATOR
Pelton single overhung impulse wheel, designed to produce 120 hp. at 450 rpm. and net effective head of 333 feet. Direct connected to 80 kva Westinghouse generator 60 cycl., 3 phase, 2400 volts, complete with 5 kw. Westinghouse direct connected exciter. Location—Western Canada. Apply
FS-128, Power
330 West 42nd Street, New York 18, N. Y.

WANTED

We Will Buy

WE WILL BUY
MOTORS — AC & DC
GENERATORS
MG SETS
TRANSFORMERS
Controls &
Switchboards
Air & Oil
Circuit Breakers

ELECTRIC GENERATOR & MOTOR CO.
4523 Hamilton Ave.
Cleveland 14, Ohio
Phone ENdicott 5656
Established 1900

Cash Ready
FOR YOUR
ELECTRICAL EQUIPMENT
Electric motors, AC and DC
Compensators
Generators
Motor Generator Sets
Air and Oil Circuit Breakers
Panels
Exhaust Fans
Control Equipment
Send us list with full details
WIRE OR PHONE
P. O. Box 534
POWER EQUIPMENT CO.
154 ANDREWS ST., ROCHESTER 4, N. Y.
Telephone Main 568 or 569

Air Compressors Wanted
STATIONARY—100 CFM AND UP
PORTABLES—2 STAGE
Ingersoll and Worthington Only
L. W. BAUER
North Bergen, N. J.

WANTED
ROLLER CHAIN
ANY SIZE—ANY MAKE—
ANY QUANTITY
NEW OR USED
W-129, Power
330 West 42nd St., New York 18, N. Y.

WANTED
One Underwriters approved 1000 G.P.M. 70 lbs. head & up—Electric 2P-60c-220 V. motor driven fire pump in good condition.
Three 40 G.P.M. 100 lbs. pressure—Electric 2P-606-202 Volts motor driven boiler feed pumps.
Two vertical HP Electric Sump pumps; 5'-0" LIFT—10'-0" HEAD.
JOHN M. SEWELL
1001 S. Broad St. Philadelphia, 47 Pa.

• WANTED •
1000 HP DIESEL-DRIVEN GENERATOR
3 phase 60 cycle, 4160 volts.
Give details, age and price.
W-143, Power
330 West 42nd St., New York 18, N. Y.

WANTED
2—800 also 2—1250 KW ALTERNATORS
3 Phase, 60 Cycle, 2300 Volts with suitable Switchboard for engine connection.
ALJON ELECTRIC DIESEL CO.
151-55 Washington St., Brooklyn 1, N. Y.
Main 4-3804

WANTED TO BUY
Complete paper mill or paper making machinery for immediate delivery. What have you to offer for immediate inspection.
A. C. ASKEW
Box 3073 Whittier Station, Tulsa 8, Okla.
Phone 6-6120

WANTED
One or two G.E. 175 H.P. type D.M.C. class 209 (6-173 H.P.—500) form L, 500 RPM—230 Volt, direct current motors—
Reply 123 Power
330 West 42nd Street, New York 18, N. Y.

WANTED
Two D.C. MOTORS
TYPE MPC, CLASS 6—150 H.P. 500, Form A, 500 R.P.M. 250 Volts, General Electric—150 H.P.
W-973, Power
330 West 42nd St., New York 18, N. Y.

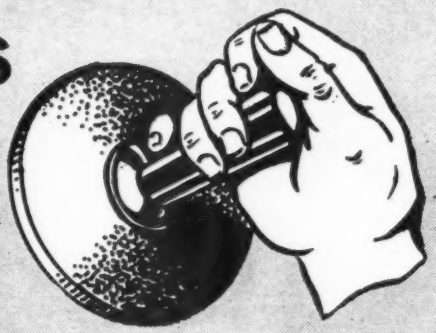
WANTED
DIESEL ENGINE
Quarry requires Several Diesel Engines and Generator Sets. 120 to 500 HP.
W.-116, Power
330 West 42nd St., New York 18, N. Y.

WANTED
BOILER
250 to 300 hp., H. R. T. preferred but will consider good water tube, straight or bent tube. Give age, pressure, price.
ROBERT W. RADCLIFF
4529 Baltimore Ave., Philadelphia 43, Pa.

WANTED
500 to 750 KW 80% P.F., 3 phase 60 cycle, 2300 volt non-condensing turbo generator 175-200 lb., 100 degree superheat 20 lb. back pressure, State age, serial number, condition and price.
W-980, Power
520 North Michigan Ave., Chicago 11, Ill.

WANTED
One 300 KW M.G. set motor 3 phase 440 volt 50 or 60 cycle synchronous. Generator flat compound wound 125 volt D.C. State make, serial No., age, condition and price.
B. S. CARPENTER
Box 6850, East Los Angeles Sta.
Los Angeles 22, California

WHEN YOU BUY USED EQUIPMENT LOOK FOR HEMPHILL'S



WHEN YOU buy Hemphill-owned Equipment, there is PREJUDGED VALUE packed in every crate . . . because OUR OWN buyers and electrical engineers have not only OK'd it for GOOD equipment . . . our REBUILDING experts have also tested and OK'd it to make sure that in workmanship and performance it meets MANUFACTURERS' standards.

HEMPHILL STANDARDS ARE MAKERS STANDARDS

MOTOR GENERATOR SETS

1—300 K.W. General Electric, 3 unit, 2200 volt synchronous to 275 volt D.C., 720 RPM.
1—150 KW. 125 Volt Westinghouse, Squirrel Cage
1—100 KW. 230 Volt General Electric, 440 volt, 3 phase, 1200 RPM. Sq. Cage
1—80 KW. 230 volt 3 unit Crocker-Wheeler Synchronous 220 volt

TURBO GENERATORS

1—600 KW. Terry dual bleeder condensing Turbine only
1—300 KW. 125/250 Volt General Electric non-condensing
1—200 KW. General Electric, 3 phase, 60 cycle, 220 volt cond.
1—200 KW. General Electric, 3 phase, 60 cycle, 220 volt cond.
1—30 KW. 135 volt, Allis-Chalmers, non-cond.

ALTERNATORS

1—500 KW. 3600 RPM. 600 volt, General Electric D.C. exciter
1—200 KVA 3600 RPM. 240 volt, Allis-Chalmers D.C. exciter
1—180 KW. 514 RPM. 550 volt, Westinghouse
1—165 KW. 514 RPM. 2400 volt, Electric Mach.
1—62½ KW. 3600 RPM. 220 volt, Allis-Chalmers
1—40 KW. 1800 RPM. 550 volt, General Electric
1—35 KW. 1200 RPM. 240 volt, Columbia Electric D.C. exciter
1—31.3 KVA. 1200 RPM. 120/208 volt, American D.C. exciter
1—12.5 KVA. 1200 RPM. 240 volt, Westinghouse, D.C. exciter

MOTORS—VARIABLE SPEED

230 VOLTS

2—200 H.P. 425/212 RPM. General Electric MPC
2—100 H.P. 950/1170 RPM. General Electric RC-37
1—40 H.P. 700/1000 RPM. Sprague L.C.
1—30 H.P. 400/120 RPM. General Electric R' C-204
1—25 H.P. 650/2200 RPM. Westinghouse SK-110L
1—25 H.P. 500/1500 RPM. General Electric RF-12
1—25 H.P. 400/1200 RPM. Westinghouse SK
2—25 H.P. 300/900 RPM. Electro Dynamic
1—15 H.P. 300/1200 RPM. General Electric RLC-2024
1—13/18 H.P. 350/1200 RPM. Electro Dynamic
3—11½ H.P. 500/1500 RPM. Westinghouse
1—7½/10 H.P. 500/1500 RPM. Reliance
1—6/7.5 H.P. 450/1800 RPM. Crocker Wheeler CMC
1—5 H.P. 500/1500 RPM. Reliance
1—5 H.P. 600/1200 RPM. General Electric LC
1—5 H.P. 450/1800 RPM. Crocker Wheeler CM
1—5 H.P. 400/1600 RPM. Diehl K6
1—5 H.P. 225/900 RPM. Electro Dynamic

TRANSFORMERS

1—1000 KVA. Auto Transf. 4150 V. 3 Ph. 4 wire to 2406 V. 2 Ph.
2—400 KVA. General Electric, 4156-250/480 volt, Scott taps
3—200 KVA. Pittsburgh 2200 volt 110/220.
3—100 KVA. Westinghouse 11430/250 volt
3—100 KVA. General Electric 13200/250 volt
3— 75 KVA. General Electric 13500/750/440 volt
2— 50 KVA. Pittsburgh 7500/15000 V. 110/220 v.
2— 15 KVA. General Electric 2300-115/230 volt

GASOLINE DRIVEN D. C. GENERATOR SETS

2—25 KW. 125 volt
1—30 KW. 125 volt
1—120 KW. A.C. 240 volt, 3 phase

MOTORS 3 PHASE 60 CYCLE

SQUIRREL CAGE

1—400 H.P. 1200 RPM. Westinghouse 220 volt
2—100 H.P. 1800 RPM. General Electric IK 440 volt
1— 90 H.P. 380 RPM. Crocker-Wheeler 550 volt
1— 75 H.P. 690 RPM. Westinghouse 550 volt
1— 60 H.P. 900 RPM. Howell Mfg. Co. SC. 220 volt
2— 50 H.P. 900 RPM. Fairbanks-Morse H. 220 volt
1— 50 H.P. 514 RPM. General Electric 1QK 220 volt
2— 25 H.P. 1800/1200/900/600 U. S., 440 volt, 3 phase

MOTORS 3 PHASE 60 CYCLE

SLIPRING

1—500 H.P. 900 RPM. Lincoln 440 volt
1—350 H.P. 293 RPM. General Electric MT-424 440 volt
1—250 H.P. 600 RPM. General Electric IM 2200 volt
1—225 H.P. 1800 RPM. General Electric I-E 220 volt
1—200 H.P. 600 RPM. Crocker Wheeler S.R. 440 volt
1—200 H.P. 600 RPM. Westinghouse CW 220 Volt
1—150 H.P. 1750 RPM. Westinghouse CW 220 volt
1—100 H.P. 900 RPM. General Electric MT vertical 220 volt
1—75 H.P. 1200 RPM. General Electric MT Vertical 220 volt.
1— 75 H.P. 900 RPM. General Electric ITC 220 volt
1— 60 H.P. 575 RPM. Allis-Chalmers 220 volt
1— 40 H.P. 1150 RPM. Cont Electric SA85 220 volt
1— 40 H.P. 1130 RPM. General Electric MT 2200 volt

MOTORS D. C. 230 VOLTS

2—450 H.P. General Electric MPL 250 volt 400 RPM.
1—250 H.P. 750 RPM. Electro Dynamic 230 volt
1—125 H.P. 1725 RPM. General Electric RC—230 volt.
1— 75 H.P. 575 RPM. General Electric C 230 volt
4— 50 H.P. 700 RPM. Crocker Wheeler CM 230 volt
2— 30 H.P. 1150 RPM. General Electric RC-31 230 volt
1— 30 H.P. 1140 RPM. General Electric RC-12 230 volt
1— 30 H.P. 750 RPM. General Electric RC-14 230 volt
1— 30 H.P. 625 RPM. General Electric C 230 volt
1— 25 H.P. 1150 RPM. General Electric CD-93 230 volt
1— 25 H.P. 600 RPM. Westinghouse SK 230 volt
1— 20 H.P. 800 RPM. General Electric RC-12 230 volt
1— 15 H.P. 350 RPM. Diehl G-312 230 volt

SYNCHRONOUS MOTORS

1—500 KVA. 900 RPM. type ATI General Electric 4150 volt, 3 phase, direct connected exciter.
2—160 H.P. 1800 RPM. Electric Machinery, 2200 volt.
1—75 H.P. General Electric, 1200 RPM. type ATI, 220 volt, 3 phase, 60 cycle.

MISCELLANEOUS

2—2100 Gallon Pumps Dayton-Dowd 190 foot head.

JLHCo

THIS SEAL IS YOUR GUARANTEE

"FOR POWER"

J. L. HEMPHILL & CO.

1604 53rd STREET, NORTH BERGEN, N. J.

PHONE NEW YORK—LONGACRE 5-3227

PHONE NEW JERSEY—UNION 3-2600

FOR SALE — IMMEDIATE DELIVERY

POWER PLANT EQUIPMENT

TURBINE-GENERATOR UNITS
3 Phase, 60 Cycle

7500 KVA G.E. condensing, 200 to 400 lbs. pressure, 2300/4000 volts, 3600 RPM complete with surface condenser, exciter, switchboard, a complete installation.

6250 KVA Allis non-condensing 450# pressure, 725° TT, 185 lbs. exhaust.

4375 KVA G.E. condensing, 2300 volts, 3600 RPM, 200 lbs. pressure equipped with condenser.

3750 KVA G.E. condensing, 200 lbs. pressure, 500° TT, 2,300 volts, 3600 RPM complete with surface condenser and switchboard.

2500 KVA G.E. condensing, 150 to 200 lbs. pressure, 2300 or 550 volts, 1800 RPM complete surface condenser, exciter and panel.

1875 KVA Westinghouse condensing, 175 to 200 lbs. pressure, 500° TT, 480 volts, 3600 RPM, complete with turbine driven exciter set, switchboard, Westinghouse jet condenser and condensing auxiliaries.

1563 KVA Allis non-condensing 200 lbs. pressure, 25 lbs. gauge back, 480 volts, 3600 RPM equipped with direct connected exciter and panel.

1250 KVA Westinghouse non-condensing, 200 to 250 lbs. pressure, 500° TT, 15 lbs. gauge back pressure, 480 volts, 3600 RPM, complete with exciter, switchboard panel.

1250 KVA Westinghouse condensing, 2400 volts, 3600 RPM, 200 lbs. pressure, equipped with direct connected shaft exciter, condenser, switchboard and instruments.

625 KVA Westinghouse condensing, 2400 volts, 3600 RPM, 200 lbs. pressure, equipped direct connected shaft exciter, condenser, switchboard and instruments.

375 KVA Allis-Chalmers Midwest non-condensing, 150 lbs. pressure, 0-10 lbs. gauge back, 2300 volts, 3600 RPM complete with switchboard.

375 KVA G.E. condensing, 150 to 200 lbs. pressure, 100° SH, 2300 volts, 3600 RPM, complete with surface condenser and auxiliaries.

125 KVA Westinghouse non-condensing, 175 to 200 lbs. pressure, 0-10 lbs. gauge back, 240 volts with direct connected exciter and switchboard.

125 KVA G.E. non-condensing, 175 to 200 lbs. pressure, 10 lbs. gauge back, 2300 volts, 3600 RPM complete with switchboard.

100 KVA Westinghouse non-condensing, 125 to 150 lbs. pressure, 10 lbs. gauge back, 2400/600 volts, 3600 RPM complete.

ENGINE-GENERATOR UNITS
3 Phase, 60 Cycle
Alternating Current

900 KVA Allis-Chalmers, 480 volts, 150 RPM generator direct connected to 24" x 36" Filer Stowell semi-Unaflow engine.

575 KVA General Electric, 460 volt, 150 RPM generator direct connected to 24" x 36" Nordberg Unaflow engine, 150 to 175 lbs. pressure, 10 to 40# back pressure.

500 KVA Westinghouse, 460 volts, 164 RPM generator direct connected to 26" x 28" Skiner Unaflow non-condensing engine, 140 to 160 lbs. pressure, 0 to 10 lbs. gauge back pressure, Complete Instalation.

375 KVA G. E. 240 volts, 200 RPM generator direct connected to 22" x 24" Skinner Unaflow non-condensing engine, 150 to 175 lbs. pressure, 5 lbs. gauge back pressure.

312 KVA Elliott, 4000/2300/550 or 240 volts, 180 RPM generator, direct connected to a 17" x 24" Elliott Unaflow non-condensing engine, 175 lbs. pressure, 6 lbs. back pressure.

200 KVA Crocker-Wheeler, 240 volts, 400 RPM generator direct connected to Ames vertical Unaflow engine, 110 to 125 lbs. pressure, 5 lbs. gauge back pressure.

150 KVA G.E. 240 volts, 225 RPM generator direct connected to Ames Unaflow engine.

ENGINE-GENERATOR UNITS
Direct Current

300 KW Allis-Chalmers, 250 volts, 150 RPM generator direct connected to 24" x 28" Chuse Unaflow non-condensing engine, 130 to 150 lbs.

150 KW General Electric, 3-wire, 115/230 volt, 225 RPM generator direct connected to Skinner Universal Unaflow non-condensing engine.

125 KW, 125 volt, 250 RPM generator direct connected to 18" x 16" Elliott engine, 100 lbs. pressure, 10 lbs. back pressure, complete with switchboard.

75 KW Westinghouse, 125 volt, 1800 RPM non-condensing turbine generator unit.

75 KW Allis-Chalmers Terry, 125 volt, 2400 RPM non-condensing turbine-generator unit.

15 KW (2) Crocker-Wheeler, 125 volts, 410 RPM generators each direct connected to an American Blower vertical engine.

SPECIAL OFFERINGS

125 KVA (8), 3 phase, 60 cycle, 480 volts, 514 RPM Electric Machinery horizontal synchronous generators. NEW.

500 KVA Westinghouse, 3 phase, 60 cycle, 600 volts, 514 RPM belted generator.

750 KVA Westinghouse, 3 phase, 60 cycle, 2300 volts alternating current generator, direct conected to 910 HP, 3 phase, 25 cycle, 2300 volts, 300 RPM synchronous motor.

1200 KVA General Electric, 3 phase, 60 cycle, 2400 volts alternating current generator direct connected to 1700 HP, 3 phase, 25 cycle, 2300 volts, 300 RPM synchronous motor.

750 HP Babcock & Wilcox Sterling water tube boiler ASME National code, 225 lbs. pressure, complete with stoker.

500 KVA (3) single phase, 60 cycle, 6600/6000 volt primary, 2300 volts secondary Pittsburgh transformers.

5300 sq. ft. Worthington surface condenser.

6000 sq. ft. C. H. Wheeler surface condenser.

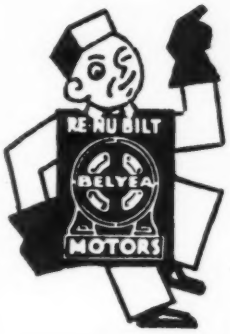
1—ALLIS-CHALMERS SYNCHRONOUS MOTOR GENERATOR SET CONSISTING OF: 1500 KW 550/600 volts, 300 RPM compound wound interpole direct current generator direct connected to a 2190 HP, 3 phase, 60 cycle, 4000 volt, 300 RPM A.C. motor.

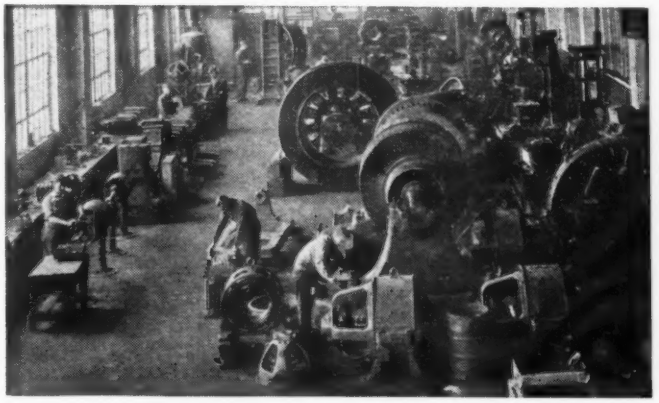
Utilities Electrical Machinery Corporation

600 NATIONAL CITY BANK BLDG
CLEVELAND 14 OHIO

WIRE OR PHONE
LONG DISTANCE 422

Typical!





What BELYEA

RE-NU-BILT *Signifies*

It means YOU—the buyer and user—get the benefit of 38 years of experience in selecting and buying quality equipment, rebuilding it, and testing it the highest of standards. The list shown below is only a sample of present stock.

This Explains Our Statement...

"SUCCESSFUL OPERATION GUARANTEED"

MOTOR GENERATOR SETS

3 Phase—60 Cycle

1—1500 KW. G.E. 275 V. D.C. to 2100 H.P. 4400/2200 V. Syn. with exciter.
1—400 KW. Whse. 125/250 V. 3 wire d.c. to 600 H.P. 2300/4600 V. Syn.
1—400—3 unit with 2—200 KW—GE DC gens. and 700 HP. 2300 v.
1—300 KW—Cr. Wh. 3 unit with 150 KW. 125 v. D.C. gens. and 450 HP—4150 v. Syn.
1—150 KW—Whse. 600 V. D.C. to 200 HP—2200 V.
1—150 KW Whse. 3 unit (2) 75 KW 125 V. Gen. D.C. to 200 HP—2300 V. Ind.
1—150 KW. GE 600 V. d.c. to 225 H.P. 440 V. Syn.
1—75 KW GE 125 V. D.C. to 120 HP—2300/4000 V. Ind.
1—50 KW GE 125 V. D.C. to 75 HP—2300/4000 V. Ind.
2—48 KW. 3 unit with 2—24 KW GE 60 volt D.C. gens. and 60 HP—440 v. Sq. Cg.
1—45 KW. Whse. 250 V. D.C. to 75 HP. 440 V.

SPECIAL
1—500 KW—GE 250 V D C. to 700 HP—2300/4150 Syn. Motor—3 phase—25 cycle with Controls.

TRANSFORMERS—60 Cycle

Qu.	Kva.	Make	Ph.	Type	Voltages
1	1050	G.E.	3	WCTH	11000x445/222½
4	525	G.E.	1	HJ	2300x445
2	333⅓	Pitts.	1	OISC	2400x220
1	300	Pitts.	3	OISC	4150x208/120
3	200	G.E.	1	HJ	2300x408/204
1	200	G.E.	2-3	Auto	2500x2500
3	100	G.E.	1	HJDD	13200x445/226
3	100	Whse.	1	OISC	13200x250

A. C. GENERATORS

3 Phase—60 Cycle

Qua.	Kva.	Make	Type	RFM.	Volts
1	37.5	G.E.	ATI	1200	220/127
1	45	Whse.		514	2200
1	125	G.E.	ATI	900	2300
1	337	Whse.		360	480

A. C. MOTORS

3 PHASE—60 CYCLE

SLIP RING

Qu.	H.P.	Make	Volts	R.P.M.	Desc.
1	2500	G.E.	6600	253	MT
1	800	Al. Ch.	440	885	ANY
1	600	Cr. Wh.	2200	507	131 AQ
1	600	Whse.	440	400	CW
1	350	G.E.	4000/2300	253	MT-442Y
1	250	G.E.	4000	257	MT-424Y
1	225	G.E.	550	720	IM-17
1	200	Whse.	440	600	CW
1	200	Whse.	2200	600	CW
1	150	Whse.	2200	580	CW
1	75	G.E.	2200	900	MT-356
1	60	G.E.	2200	1755	MT-337

SQUIRREL CAGE

1	725	G.E.	13800/2300	600	KT
1	400	G.E.	2200	1175	IE-15B
1	400	Whse.	2200	585	CS-1104
1	300	G.E.	2200	600	IK
1	300	G.E.	440	900	IK
1	250	G.E.	440	600	IK
1	200	G.E.	550	580	IK
1	200	G.E.	2300	1175	IK
1	200	G.E.	440	580	IK
1	200	Al. Ch.	2300	1175	
2	175/112	G.E.	440	900/720	IK
2	150	G.E.	440	1200	K-6325SB. Brg
1	150	G.E.	440	600	IK
2	100	G.E.	440	900	IK
1	100	G.E.	220	1200	IK

SYNCHRONOUS

2	2100	G.E.	2200/4400	514	ATI
1	700	Whse.	4600/2300	1200	
1	600	Al. Ch.	2200	720	
1	125	G.E.	2300	900	ATI

SYNCHRONOUS CONDENSER

1	5000	Whse.	2300/4000	900	

ROTARY CONVERTER

3 PHASE—60 CYCLE

Qu.	Kw.	Make	Speed	D.C.V.	Trans. V
1	1500	Whse.	720	600	2300
1	1500	Whse.	600	600	11500
1	1250	G.E.	720	250	2300
1	1000	G.E.	900	600	13200
1	1000	Whse.	900	600	11000
1	750	Whse.	720	250	6600/2300
1	500	Whse.	1200	600	13200/2300

3 PHASE—25 CYCLE—BOOSTER TYPE

2	1500	G.E.	500	225/275	13200/6600

All units can be furnished with A.C. & D.C. control.

SPECIAL
1—2000 amp., 3 pole, 15000 V. Conduit type F-120-15 D, 230 V Sol. operated OCB —1000 000 uninterrupting capacity.

D. C. MOTORS

Qu.	H.P.	Make	Type	Volts	Speed
1	800	G.E.	MPC	550	600
2	700	G.E.	MCF	600	150/525
1	650	G.E.	MPC	250	115/145
1	325	Whse.		230	1050/1250
3	350	G.E.	MPC	230	450
1	300	G.E.	MPC	230	275/550
1	300	G.E.	DMC	230	400/600
2	300	Cr. Wh.	CCM-151H	230	630/700
1	250	G.E.	MPC	230	400/500
1	250	Al. Ch.		230	525
1	135/175	G.E.	MCF	230	450/1050
1	150	G.E.	MPC	230	250/450
2	130	Cr. Wh.	CMC-65H	550	1200
2	125	G.E.	CO-1832	230	625
1	75	Cr. Wh.	100HL	230	350/900
1	75	Whse.	SK-180L	115	650
1	75	G.E.	C	230	650/960

TURBO GENERATOR SETS

1—500 KW—Whse. 625 KVA. 440 v. 3 ph. 60 cy. 3600 RPM with Parsons 145/175 lbs. condensing turbine with jet condenser and accessories.
1—75 KW Ridgeway 250 V. D.C. with Terry 180 lb. with 12 lb. back pressure, 2000 RPM.

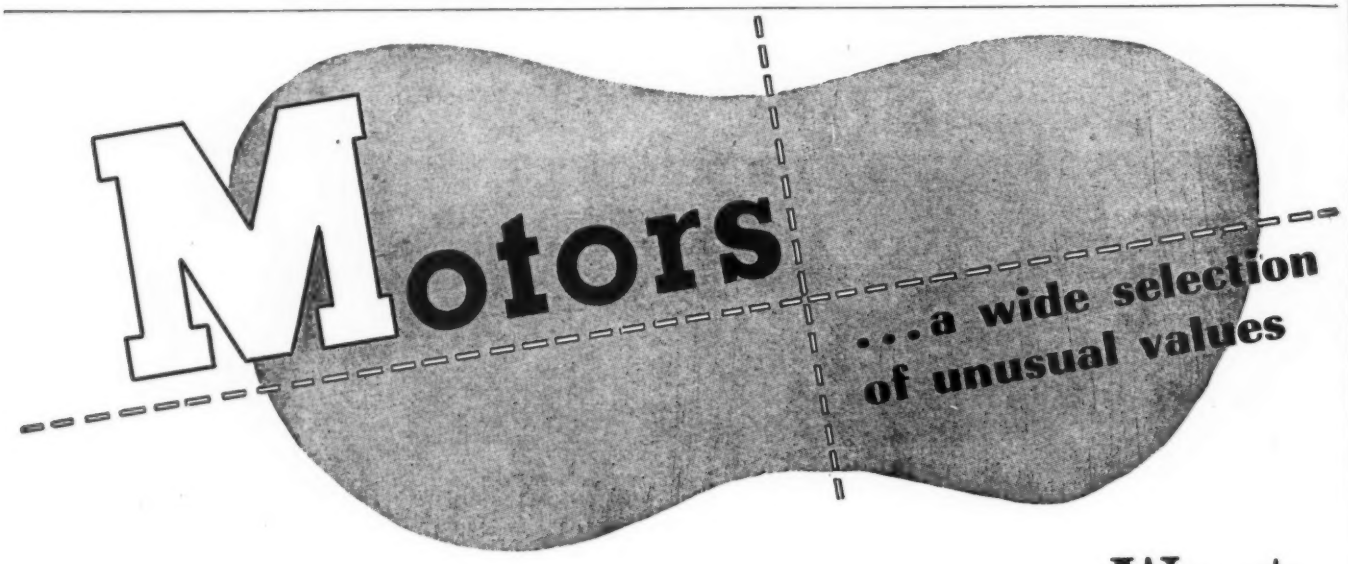
38TH YEAR OF SERVICE

WE OWN WHAT WE ADVERTISE IT HAS TO BE GOOD!

BELYEA COMPANY, INC.

We Buy for Stock — for CASH
What Surplus Do You Have?
PHONE—JOURNAL SQUARE — 2-3334
Also
N. Y. CITY LINE — RECTOR 2-7150

Main Office and Shop
43 HOWELL STREET
JERSEY CITY 6, N. J.



Listed below a few of the motors available in a hurry from Wente

SQUIRREL CAGE

3 Phase, 60 Cycle, 220/440 Volt

Qu.	HP	Make	Type	Speed
1	150	Al. Ch.		1750
1	150	G.E. 2200 v.	IK	720
1	100	G.E. 2200 v.	IK	600
1	100	West. 2200v.	CS	1800
1	100	R'way 440v.		1200
1	100	West. 2000v.	CCL	1720
1	100	G.E.	I	340
1	100	G.E.	I	290
1	75	Lincoln	C10	1200
1	75	F.M. 550v.	H165C	900
1	75	Lincoln	IQ	600
1	75	G.E.	KT502	450
6	75	G.E. 440 v. new Ball Bearing	K	1800
1	50	G.E.	I	720
2	50	West.	MS 25 cy.	720
1	50	Wag.	BM	495
1	50	Al. Ch.		490
1	40	Triumph	B12	850
2	35	Al. Ch.	2 ph.	865
2	35	Al. Ch.		865
1	35	F. Wayne	2 ph.	900
1	35	G.E.	25 cy.	730
1	30	F.M. 2200v.	HD12B	3600
1	30	Howell	SC	1200
1	30	Al. Ch.		1200
1	30	Louis A.	P405	1140
1	30	Louis A.	KH	1170
1	30	West.	CCL	900
1	30	Wagner	22VBR	860
1	30	Line. Weld	ED445TEFC	850
1	30	Al. Ch.		860
2	30	Al. Ch.	AN 2 ph.	860
1	30	Century	A8 25 cy.	720
5	30	West. new B.B. 440v.		1750
7	25	West. new B.B. 440v.		1160
6	25	G.E. B.B. 440v.		1160
1	25	R. & M	K207	1750
1	25	Howell		1200
1	25	Lincoln		900
1	25	G E	KT332	900
1	25	Al. Ch.		860
1	25	Rel. (elevator)	T. E.	750
1	25	Al. Ch.		720
1	25	G.E.	M10	720
1	25	West.	C8644C	690
1	20	West.	CCL	3600
1	20	Al. Ch.		1700
1	20	Century		1740
1	20	F. M.	KRV	1200
1	20	West.		1200
1	20	Wagner		1150
1	20	Ideal	A	1150
2	20	Wagner	HRP404	1060
1	20	Cleve.	M-147	900
1	20	Al. Ch.		860
1	20	R. & M.	K-207	900
1	20	West.	CS-644	870
1	20	West.	MS	900
1	20	F. M.	H	870
1	20	West.	CCL	580
1	20	Wagner	CM	445
1	18	West.	MS-4 (Elev.)	720
1	15	West.	CCL	1700
1	15	Wagner	13VRW 2 ph.	1725
1	15	Rel.	B326	1750
1	15	Wagner	13VRW 2 ph.	1725
1	15	Cr. Wh.	1150	1720
1	15	West.	CS-460C	1200
1	15	Wagner	15TCP-TEFC	1140
1	15	G.E.	KT512	875
2	15	West.	CS-573 25 cy.	725
2	15	West.	MS 25 cy.	725
1	15	West.	CS567C 25 cy.	715
1	15	West.	MS 25 cy.	600
1	10	Al. Ch.		3450
1	10	G.E.	KT302	900
1	10	West.	CS 25 cy.	725
1	10	West.	MS 25 cy.	720
2	10	West.	CS473C 25 cy.	615
10	10	West. new B.B. 440v.		1750
1	7½	Al. Ch.		860
1	7½	Wagner	MCP-365	1140
1	7½	Lima	RS-405 b.b.	514
110	5	Wagner new B.B.S.P. 440 v.		1750
11	5	West. new B.B. 440 v.		1160

SLIP RING

3 Phase, 60 Cycle, & Syn.

Qu.	HP	Make	Type	Speed
1	443	El. Mach.		900 Syn.
1	275	Al. Ch.		1170
1	200	F. M.	BV	600
1	200	Al. Ch.		1175
1	200	Westg. 2200 v.		600 Syn.
2	75	F. M. 2200v.	BV-H16B	1800
1	75	G.E.	MT552	865
1	50	G.E.	IM	1150
1	50	Triumph	C12	1150
1	50	G.E.	IM	900
1	50	G.E.	IM 25 cy.	700
1	50	Al. Ch		690
2	40	G.E.	MT336	1200
1	40	Al. Ch		1160
1	40	W'g 2200v.	CW	870
1	40	Westg.	CW-653A	870
1	40	Al. Ch.		870
1	40	G.E.	MY-W	880
1	40	Westg	C1753A 25 cy. cr.	730
10	35/15	G.E.	OMT336	1150/550
1	35	Al. Ch.	25 cy	720
2	35	G.E.	IM	570
1	30	F. M.	AD A/t.	1200
1	20	Imperial	DW-D37	1800 Syn.
1	22	G.E.	ITC5011 (hoist)	680
1	25	Westg.	MW 322A	680
1	25	G.E.	MT342	600
1	25	G.E.	MT356	400
1	20	Triumph	C10	1200
2	15	G.E.	MT302	1200
1	15	G.E.	MT332	720
1	15	Triumph	C11	685
1	15	Westg.	CS	585
1	15	G.E.	MT556	280
1	10	Westg.	CW364 (Ex. proof)	1750
3	10	Westg.	CW464A	1200
1	10	Westg.	HF	1140
1	10	W. E.		1200
1	10	G.E.	IM	1200
1	7½	G.E.	MT182	1750
1	7½	Westg.	CW-452A	1200

DC—230 Volt

Qu.	HP	Make	Type	Speed
1	75	Diehl	K11	700
1	100	G.E.	CD 123	1200
1	60	Westg. 115v.	SK140L Bert.	1140
1	60	G.E.	EF1	1200
1	40	Rel. 440 v.	13LT Vert.	1750
1	40	Rel. 440 v.	230T Vert.	1130
1	25	C.W. 440 v.	CMC-EH Vert.	1150
2	40	Westg.	SK 123	1150
3	40	G.E.	RC 32	1100
8	40	Westg.	SK 140	775
1	35	R. C.	11B	1500
1	35	Al. Ch.		1200
1	35	G.E.	DLC 203	700
1	35	Westg.	SK 163 300/1200 Vert.	
1	30	El. Dy.	15S	625
1	30	Westg.	SK 110L	1150
1	30	Rel. 440 v.	13t T Vert.	1150
4	30	Reliance	92 TF	1750
1	27½	G.E.	CVC 116	1750
10	25	Westg.	SK 120	825
3	25	Westg.	SK 103	1150
1	25	Westg.	SK 90	1400
4	25	Westg.	SK 100 L	1150
1	30	G.E.	RC 51B	1150
1	25	Sprague		850/2000
1	25	Westg.	SK 123	550/1100
1	25	Al. Ch.	E 120	500/1500
1	25	G.E.	RF 12	400/1200
2	25	Westg.	SK	400/1200
1	25	J. & L.		625
2	20	Reliance	131T	1000
2	20	Diehl	K914A	500/1500
2	20	Westg.	SK113	500/1500
1	20	G.E.	RF12	250/1000
1	20	Lincoln	FKW B.B.	1800
1	20	Westg.	SK70L	1700
6	20	Cr. Wh.	CMC T.E.B.B.	1750
1	20	Cr. Wh.	CMC T.E.B.B.	1150
1	20	Westg.	SK93	1150
11	20	Reliance	92T	1150
1	20	Westg.	SK120 T.E.	1100
3	20	Westg.	SK100L	900
1	20	Watson	K	850
3	20	Reliance	131T	850
1	20	G.E.	RC30	750
1	20	Westg.	SK110L-115V	750

DC—230 Volt

Qu.	HP	Make	Type	Speed
4	20	Westg.	SK110L	750
1	20	Cr. Wh.	CW-CMC	600
1	20	Westg.	SK120	500
3	20	Al. Ch.	K	500/1000
1	15	Reliance	46TF	1750
2	15	Westg.	SK63	1750
1	15	Westg.	SK113 encl.	1750
1	15	G.E.	RC29A	1700
1	15	Westg	SK93	1150
4	15	Westg.	SK83	1150
4	15	Cr. Wh.	CW-CCM T.E.	1150
1	15	Westg.	SK70L	1250
1	15	G.E.	CD83	1150
1	15	G.E.	RC10	1150
1	15	G.E.	RC29	1150
4	15	Westg.	SK93	850
4	15	Reliance	92TF	850
4	15	R. & M.		1000
1	15	G.E.	CVC-115	925
6	15	Westg.	SK90 Vert.	825
1	15	G.E.	RC29	750
6	15	Westg.	SK110L	675
1	15	Al. Ch.		1075
8	15	Reliance	131T	550
3	15	Reliance	92T	850/1700
1	15	Reliance	66T	800/1600
1	15	Westg.	SK	500/1500
2	15	Westg.	SK110L	400/1600
1	15	Triumph	32F	300/600
1	15	Triumph		225/900
4	12½	Westg.	SK	750/1500
7	10	Westg.	SK70	850
2	10	Reliance	66TF	850
2	10	G.E.	RC29	850
20	10	Westg. SK60L-SK60-Reliance 46TF		1150
10	10	Cr. Wh.	CM-CHB T.E.B.B.	1750
4	10	Westg.	SK43	1700
1	10	G.E.	RF11	600/2400
4	10	G.E.	RF10	600/1800
6	10	Westg.	SK80L	500/1500

DC—230 Volt

Qu.	HP	Make	Type	R.P.M.
23	10	Al. Ch		500/1000
1	10	G.E.	RF10	400/1200
2	10	Kimble	BA324 new B.B.	1750
1	10	Westg.	SK91	250/1000
21	7½	Westg.	SK33	1750
16	7½	Westg.	SK43	1150
20	7½	Westg.	SK60	850
20	5	Westg. & G.E.		1750
60	5	Westg. Rel.		1150
50	5	Westg.	SK43	850
75	3½	Westg.	SK33	850
80	3	Westg.	CD925	1725
120	3	Westg.	SK20	1150
60	2	Westg.	SK & CD	1150
50	2	Westg.	SK20	850
40	1½	Westg.	CD	1150
30	1½	Westg.	CD925	550/2200

2—200 KW, Westinghouse, 2200 to 250 Volt, DC, latest type variable voltage, 900 RPM, M-G sets, complete with control.

2—150 KW, Westinghouse SK, 2200 to 250 Volt, 900 RPM, synchronous M-G sets complete.

1—100 KW, General Electric, 2200 to 250 Volts, 900 RPM, synchronous M-G set complete.

The **Wente** *Electric Co.*

Hamilton, Ohio

Rebuilt Motors & Generators

Since 1906

Dependable Rebuilt Electrical Equipment

1 YEAR GUARANTEE

3 Ph. Squirrel Cage Motors

Qu.	H.P.	Make	Type	Speed
1	150	G.E.	KT-547S	1750
4	150	El-Mchy.		1150
1	147	West.	25 cyc.	715
2	100	G.E.	BTA-440V.	375/750
1	75	G.E.		1750
1	70	G.E.	Synch.	1200
3	60	G.E. & West.		690
1	50	G.E.	KT-326	1750
1	50	West.	CCL	1150
1	50	Cr. Wh.	1220	1150
1	50	Cr. Wh.	122Q	865
1	50	West.	CS	580
1	50	G.E.	I-14	495
1	46	W.E.		150/900
1	40	Triumph	TR	690
1	40	W.E.		150/900
1	35	Wagner		850
1	30	U.S.	Vert.	3450
1	30	Cr. Wh.		870
1	30	Watson		850
1	30	West.	CCL	690
1	25	Wagner	Fy. Welch.	1200
1	25	Wagner	Vert.	1160
2	25	West.	CS	1160
1	25	Century	AS-35	870
1	25	G.E.	IK	870
1	20	G.E.	KT-312	1700
1	20	G.E.	Vert.	1750
1	20	R & M	K-207	1160
1	20	West.	CS	1150
1	20	G.E.	Vert.	1175
1	20	Al. Ch.		870
1	20	Diehl		860
1	15	G.E.	KT-752	1750
1	15	Wagner	Fy. Welch.	1800
1	15	El. Spec.	Synch.	1800
1	15	G.E.	KT-312	1150
1	15	Howell		1150
1	15	Al. Ch.		1150
1	15	G.E.		1150
1	15	Lincoln		1150
4	15	West.	MS	1150
1	15	G.E.	Vert.	870
1	15	G.E.	KT-512	870
1	15	Wagner	15VPR	860
1	15	Wagner	Fy. Welch.	720
1	15	West.	CS-504	415

2 Ph. Squirrel Cage Motors

Qu.	H.P.	Make	Type	Speed
1	100	West.	CS-663C	1750
1	70	G.E.	Synch.	1200
1	75	G.E.	IQE	1750
1	50	Lincoln	C-15	870
1	50	G.E.	IQ	870
1	40	Al. Ch.		870
1	35	Al. Ch.		870
1	30	West.	CCL	1150
1	30	Wagner	BP	1140

LEEDS & NORTHRUP
MICROMAX

INDICATING
THERMOCOUPLE PYROMETERS

Model S Recorders

Model C Controllers

Model B Recorders

Some New—
All Others Equal to New

2 Ph. Squirrel Cage Motors

Qu.	H.P.	Make	Type	Speed
1	25	Burke		870
3	25	G.E.	IQL	1150
1	25	West.	CCL	1150
1	15	F-M		1750
1	15	G.E.	KQ-502	1150
1	15	West.	CS	1155
1	15	Al. Ch.		1130
1	15	West.	CS-572	860
1	15	G.E.	IQ	690

A.C. Slip Ring Motors

Qu.	H.P.	Make	Type	Speed
1	112	G.E.	ITC	720
1	79	West.	CW	1170
1	75	Al. Ch.	Hoist	575
1	64	G.E.	MTO-552	585
1	60	West.	CW-956A	290
1	50	G.E.	MT	600
1	52	G.E.	ITC	860
1	50	Al. Ch.		865
1	50	G.E.	MT-342	860
1	40	West.	HF	850
1	40	Lincoln	IXL	690
1	40	G.E.	MT-352	570
1	35	Al. Ch.		870
1	30	G.E.	ITC	1200
1	30	G.E.	M-526	1150
1	30	G.E.	MQ-332	870
1	30	West.	CI-574A	870
4	30	West.	CI-582C	870
2	30	G.E.	MT-542	690
2	25	Al. Ch.		870
1	25	Howell	SRS-420	870
1	25	G.E.	1M	565
1	20	West.		870
1	15	G.E.	MT-502	1130
1	15	West.	CW	870
1	15	G.E.	MT-512	845

A.C. Slip Ring Motors

Qu.	H.P.	Make	Type	Speed
1	15	Al. Ch.		680
1	15	G.E.	MQ-332	670

A.C. Generators

Qu.	K.W.	Make	Voltage	Speed
1	106	El-Mchy.	208/120	1200
1	150	G.E.	240/480	600
1	100	West.	240/480	600
1	50	F-M	240/480	1200
1	50	El. My.	208/120	900
1	30	Burke	220/440	900
2	30	Century	208/120	1200

230 Volt D.C. Motors

Qu.	H.P.	Make	Type	Speed
1	350	West.	SK	340/425
1	75	West.	SK151	250/1000
1	60	G.E.	C-Inter.	480/1100
1	50	G.E.	RC-19	400/1200
1	45	Diehl	K-10	850
1	40	G.E.	DLC	1050
2	35	West.	SK-120	1150
1	35	G.E.	RLC-204	440/800
2	35	West.	SK-160	400/600
1	30	G.E.	RC-32	1100
1	30	West.	SA	500/1500
3	25	G.E.	RC-31	1150
1	25	West.	SK	1100
1	25	Reliance	92T	1150
1	25	Al. Ch.		850
1	25	Rel.	MS	500/1500
1	25	Rel.	H3	400/1200
1	25	G.E.	RF	400/1200
3	20	G.E.	RF	500/1500
1	20	G.E.	RF	400/1200
1	20	G.E.	CD-83	1200
1	20	R. & M.		1160
1	20	G.E.	RC-11	1150
3	20	West.	SK-110L	750
1	20	West.	Hoist	700
1	15	Rochester		3450
1	15	West.	SK-83	1150
2	15	G.E.	RC	1150
1	15	G.E.	CD-Vert.	900
1	15	G.E.	CD-85	850
2	15	G.E.	RC-30	850
1	15	Sprague	D	700
1	15	West.	SK	675/1350
1	15	West.	SK-100L	600/2500
2	15	West.	SK	500/1500
1	9	L-A	Baler	1750
4	10	G.E.	RC	1150
2	10	G..E..	CD-75	1150
1	10	Diehl		900
1	10	G.E.	CD-83	850
1	10	Roth		800
1	10	Diehl	LS-14	750
1	10	West.	Elevator	700
1	10	G.E.	CVC	700
1	10	West.	SK	600/1200
1	10	G.E.	RLC	500/1500
1	10	West.	SK	500/1500
2	10	G.E.	RF-10	400/1600
2	10	West.	SA	400/1200
1	10	West.	SK-90	400/1200
1	10	Diehl		200/247
1	7½	Sturt.	TF	3600
1	7½	El. Dyn.	2S	1750
1	7½	G.E.	RC	1150
6	7½	West.	SK-40	1180
1	7½	G.E.	CO-1804	
1	8	L-A	Baler	1200
2	7½	West.	SK	850
2	7½	G.E.	RC	850
1	7½	West.	SK-60	850
2	7½	G.E.	RF-9	600/1800
1	7½	G.E.	RF-10A	600/1500
1	7½	West.	SK-90	650/1300
1	7½	El. Dyn.	3S	550/1650

230 Volt D.C. Motors

Qu.	H.P.	Make	Type	Speed
1	7½	G.E.	RF-10	450/1800
1	7½	G.E.	RF-10	450/1600
1	7½	G.E.	RF	450/1800
2	7½	West.	SK-70	400/1600
1	7½	Al. Ch.		350/1050
1	7½	L-A	Baler	

110 Volt D.C. Motors

Qu.	H.P.	Make	Type	Speed
1	45	G.E.	RC	1100
1	25	G.E.	CD95	1150
2	10	Lincoln	I-SC	3500
1	10	L-A		3500
1	10	E. Dyn.	3S	1100
1	10	West.	SK-70	850
1	10	Reliance		400/1600
2	10	Diehl		230
1	7½	G.E.	CVC	725
1	7½	El. Dyn.	5S	450/900
1	7	El. Dyn.		600/1200

D.C. Generators

KW	Make	Voltage	Ampere	Speed
300	Burke (2)	250/125	1200	900
300	West. (2)	250	1200	900
250	G.E.	125	2000	720
100	G.E.	125	800	1150
100	Al. Ch.	250/125	400	1150
50	G.E. (2)	125	400	1150
50	G.E.	250	200	870
40	Rel. v.s.	250	160	1750
30	El. Dyn.	600	50	1150
30	G.E.	125	240	1150
30	G.E.	250	120	1750
25	G.E.	125	200	1150
20	West.	250	100	1150
10	West.	250	40	1150
10	West.	125	80	1150
7½	G.E.	250	30	1150
7½	West.	125	60	1150

AIR COMPRESSORS

12½"x12"	American
10"x6"	Gardner
9"x8"	Ingersoll Rand
9"x8"	Sullivan
7"x6"	Ingersoll Rand

D.C. to A.C. Generators
1 to 10 K.V.A.
115 and 230 V.D.C. to
1 ph. and 3 ph. 110-220
& 440 V. A.C.

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L. J. LAND & COMPANY

146 GRAND STREET, NEW YORK 13, NEW YORK

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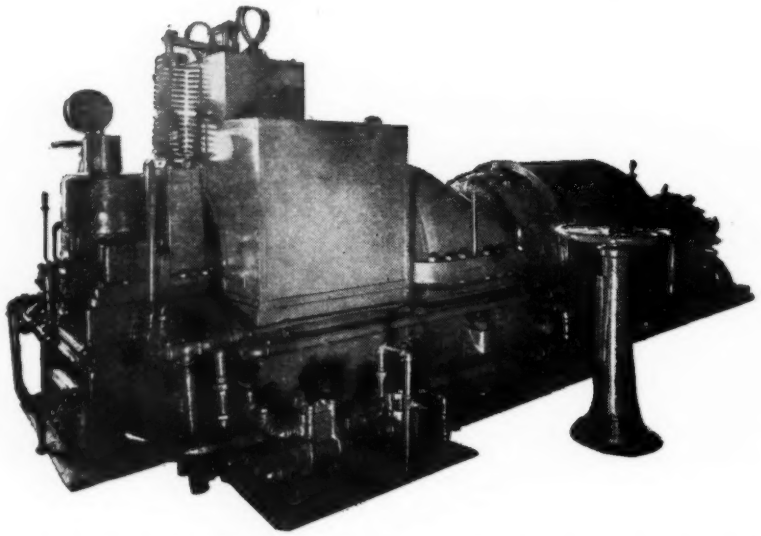
TURBO-GENERATORS



WESTINGHOUSE, 1000-KW, Aut. Extraction-Condensing Turbine-Generator

A Partial List of OUR STOCK is noted Below

7500—KVA. G.E. Sur. Cond., 190/375#: 2300-v.
6250—KVA. G.E. Sur. Cond., 200, 2300#-v.
5000—KVA. G.E., Sur. Cond., 200/400#: 2300/4000-v.
3750—KVA. G.E. Sur. Cond., 200#, 2300-v.
3125—KVA. G.E. Sur. Cond., 200#, 2300-v.
2500—KVA. G.E. Sur. Cond., 200#, 2300-v.
2000—KVA. G.E., Non-cond. 200#, 2300-v.
1875—KVA. G.E., COND. 200#.
1875—KVA. Elliott 300#-G, 2300-v.
1565—KVA. G.E. Sur. Cond. 150#, 2300
1250—KVA. Westinghouse, 200#, 2300-v.
1250—KVA. Allis-C. Non-cond. 150#, 840-v.
1250—KVA. West. Sur. Cond. 200#, 2300
1250—KVA. Allis-C. Non-Cond. 150#, 480-v.
937—KVA. Allis-C. Cond. 200#.
937—KVA. G.E., 200#, 2300-v.
625—KVA. G.E., 200#, 2300-v.
375—KVA. G.E., Cond. 200#, 2300-v.

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BOILERS AND

GENERAL POWER PLANT

EQUIPMENT

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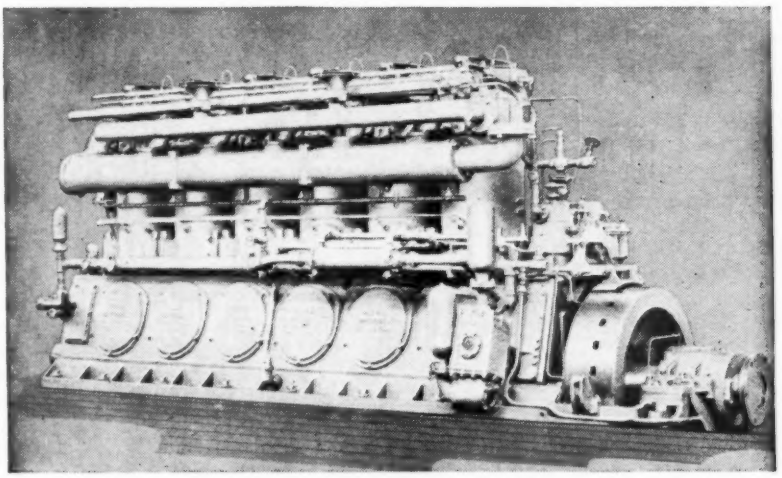

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Also Any Other Size or Capacity Diesel Engine Desired

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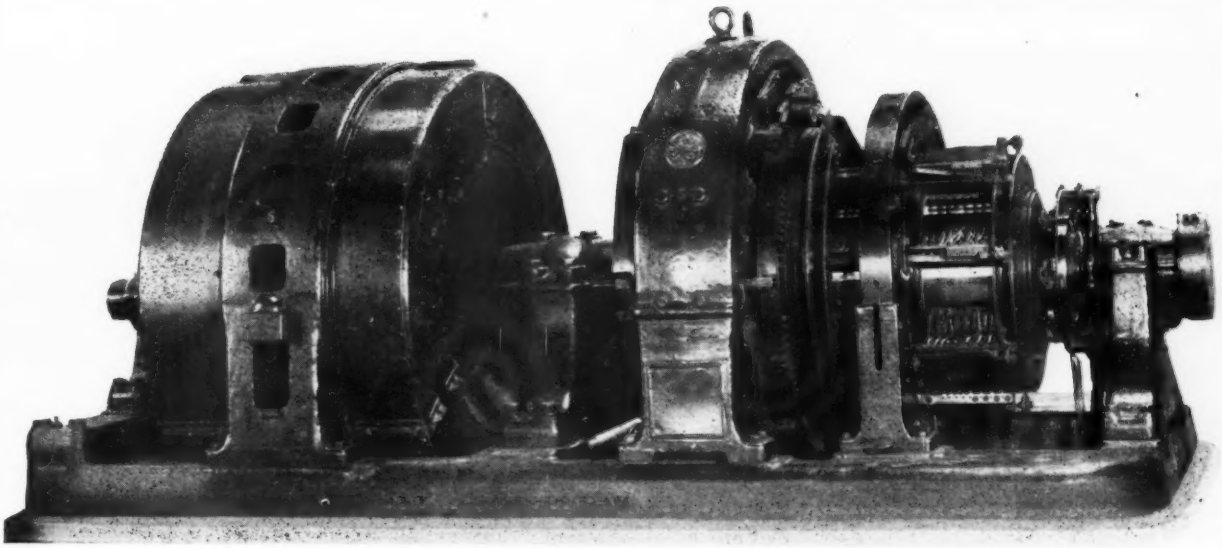


1800 KW GENERAL ELECTRIC SYNCHRONOUS MOTOR GENERATOR SET

1—1800 KW 50 deg. General Electric compound interpole direct current generator type MCF form L 275 volts 6550 amps. 600 RPM #1358377 mounted on common cast iron sub-base and direct connected to

1—2500 HP 85% P.F. 2400 KVA 50 deg. General Electric synchronous motor type ATI from C 3 phase 60 cycle 13200 volts (can be reconnected for 6600 or 2300 volts) 600 RPM #4097530

The above motor generator set is in excellent condition, complete with automatic switching equipment and available immediate shipment.

TURBINE UNITS

3 phase 60 cycle

15000 KVA G.E. 13800 V. Cond. 425#
10000 KVA G.E. 4000 V. Cond. 200#
6250 KVA West. 2300 V. Cond. 400#
4000 KVA Allis 600 V. Cond. 150#
3125 KVA G.E. 2300 V. Cond. 175#
2500 KVA West. 2300 V. Cond. 200#
2500 KVA G.E. 480 V. Noncond. 150#—15# back pressure.
1875 KVA West. 240 V. Bleed. 400# 90# extraction
1875 KVA West. 240 V. Noncond. 400#—90# back pressure
1563 KVA Allis 2300 V. Cond. 210#
1250 KVA Allis 480 V. Bleed. 150# 12# extraction
938 KVA Allis 2300 V. Bleed. 175# 25# extraction
625 KVA West. 480 V. Bleed. 250# 5# extraction
625 KVA G.E. 240 V. Noncond. 200#—50# back pressure
312 KVA Moore 240 V. Noncond. 425#—18# back pressure 125# bleeder

DIESEL UNITS

3 phase 60 cycle

1000 KVA McInt. Sey. 4000 V. 300 RPM
600 KVA Rathbun 480 V. 360 RPM
500 KVA Fair. Mor. 2400 V. 257 RPM
300 KVA Fair. Mor. 2400 V. 257 RPM
250 KVA Buckeye 480 V. 514 RPM
250 KVA Fair. Mor. 2400 V. 257 RPM
150 KVA Fair. Mor. 2400 V. 257 RPM
118 KVA Winton 240 V. 400 RPM
100 KVA Superior 240 V. 720 RPM
50 KVA Fair. Mor. 240 V. 1200 RPM

UNIFLOW UNITS

3 phase 60 cycle

1000 KVA Skinner 480 V. 150#
750 KVA (2) Skinner 2400 V. 175#
750 KVA Chuse 2400 V. 150#
375 KVA (2) Skinner 240 V. 150#
350 KVA Ames 2400 V. 150#
250 KVA Skinner 240 V. 150#
150 KVA Ames 240 V. 150#

WATER TUBE BOILERS

1260 HP B&W 250# with stoker
1300 HP Springfield 400# with pulverizer
1000 HP Springfield 225# with pulverizer
750 HP (2) Stirling 250# with stokers
700 HP (2) Stirling 425# with pulverizer
600 HP B&W 200# with stoker
500 HP (3) Heine 210# with stokers
403 HP Stirling 250# with stoker

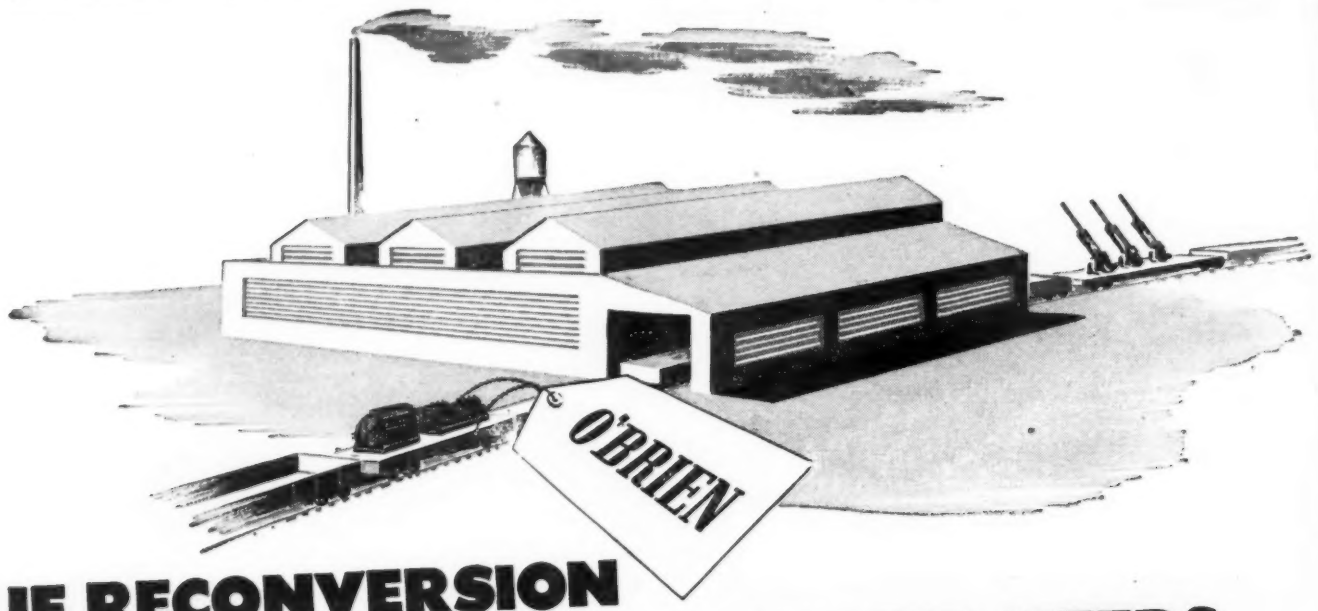
MOTOR GENERATORS

3 phase 60 cycle

300 KW C.W. Syn. 125/250 volts D.C., 4000 volts A.C.
200 KW G.E. Syn. 275 volts D.C., 2300 volts A.C.
150 KW West. Syn. 125 volts D.C., 2300 volts A.C.

INTERNATIONAL POWER MACHINERY CO.

UNION COMMERCE BLDG. Telephone: MAin 9514 CLEVELAND 14, OHIO



IF RECONVERSION CHANGES YOUR POWER NEEDS . . .

IT'S a matter of availability, speed, service and economy when you make equipment changes to meet new power requirements. You can easily solve this four-way problem by putting it up to O'BRIEN. We carry *in stock* a wide line of well known makes of new machinery for immediate shipment. Our engineers will gladly help you apply and adapt the equipment to your specific needs.

If economy is your primary consideration, keep your capital investment to a minimum with O'BRIEN *rebuilt* power plant equipment. Rebuilt the O'BRIEN way means *completely* rebuilt, thoroughly tested and guaranteed. O'BRIEN facilities include extensive shops as well as steam and electrical testing facilities comparable to those of leading manufacturers. Exact testing under load conditions before shipment is your assurance of getting completely overhauled machinery into which we've built many extra years of useful life.

If your problem is disposal of surplus equipment or an entire plant, O'BRIEN can help you here, too. For we are constantly seeking machinery of all types to meet the growing demands of our customers. Remember, you can buy from or sell to O'BRIEN with the same degree of confidence. And this service is just as close as your telephone!

NEW—USED—GUARANTEED REBUILT MACHINERY CARRIED IN STOCK FOR PROMPT SHIPMENT

POWER PLANT EQUIPMENT: Turbo Generators • Engine Generators • Diesel Engines Boilers • Motor Generator Sets • Electric Motors • Air Compressors • Pumps • Heaters • Complete Power Plants • **METAL-WORKING MACHINERY:** Machine Tools of All Kinds • Pipe Machines • Punches • Shears • Welders • Presses and Forging Equipment.

REPRESENTATIVES IN PRINCIPAL CITIES OF THE WORLD

Everything From a Pulley to a Powerhouse

THE O'BRIEN MACHINERY CO.

T.M. REGISTERED U.S. PATENT OFFICE

Bell Telephone: MARKET 4180 — PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS — Cable Address: OBRIEN PHILA

113 NORTH THIRD STREET • PHILADELPHIA 6, PA., U. S. A.

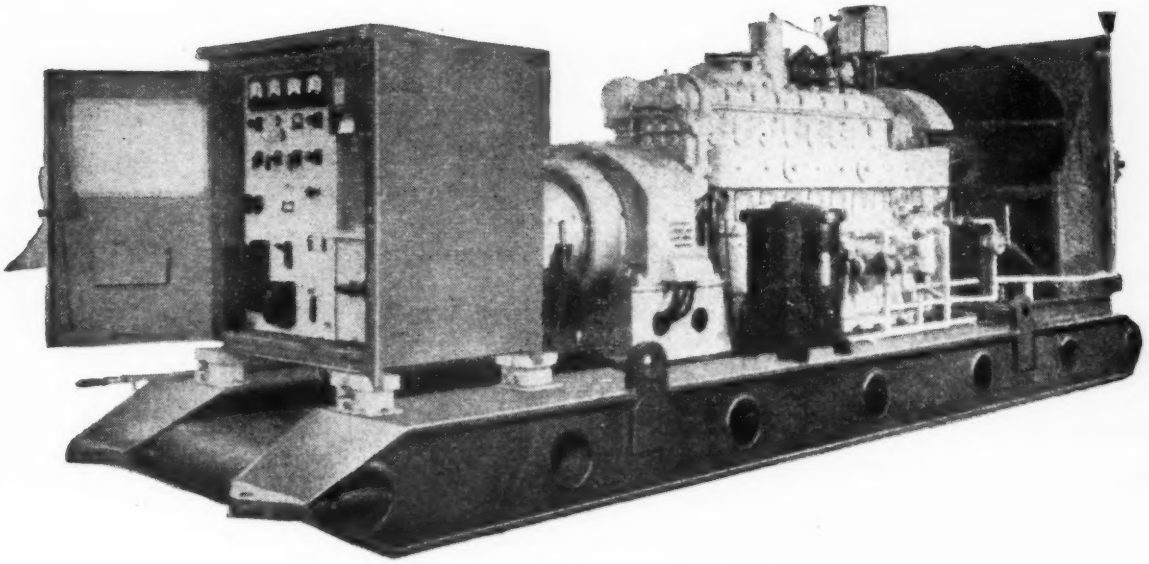
AFFILIATED WITH

SOC EXPANSÃO INDUSTRIAL SUL AMERICANA LTDA

RUA CANDELARIA, 9 . RIO DE JANEIRO — BRASIL

NEW DIESEL GENERATOR SETS

IMMEDIATE DELIVERY



HP	ENGINES	MODEL	KVA	RPM	YEAR
4—1600	General Motors	16–278A	1250	720	1944
11— 750	Cooper Bessemer	FS 8	625	1200	NEW
1— 750	Enterprise	DSQ 6	625	327	1938
1— 750	Superior	OS	625	327	1933
7— 720	Alco	8B25	625	600	1945
11— 450	Cooper Bessemer	FS 8	375	600	NEW
1— 450	General Motors	6–278A	375	600	NEW
1— 380	Chicago Pneumatic	89	300	720	NEW
1— 375	Alco	5B25	372	360	1938
1— 375	McIntosh Seymour	3B32	372	360	1931
1— 375	Fairbanks	32E	300	300	1936
1— 360	Fairbanks	32VA	300	257	1928
7— 300	General Motors	8–268A	250	900	NEW

Running Inspection by Appointment

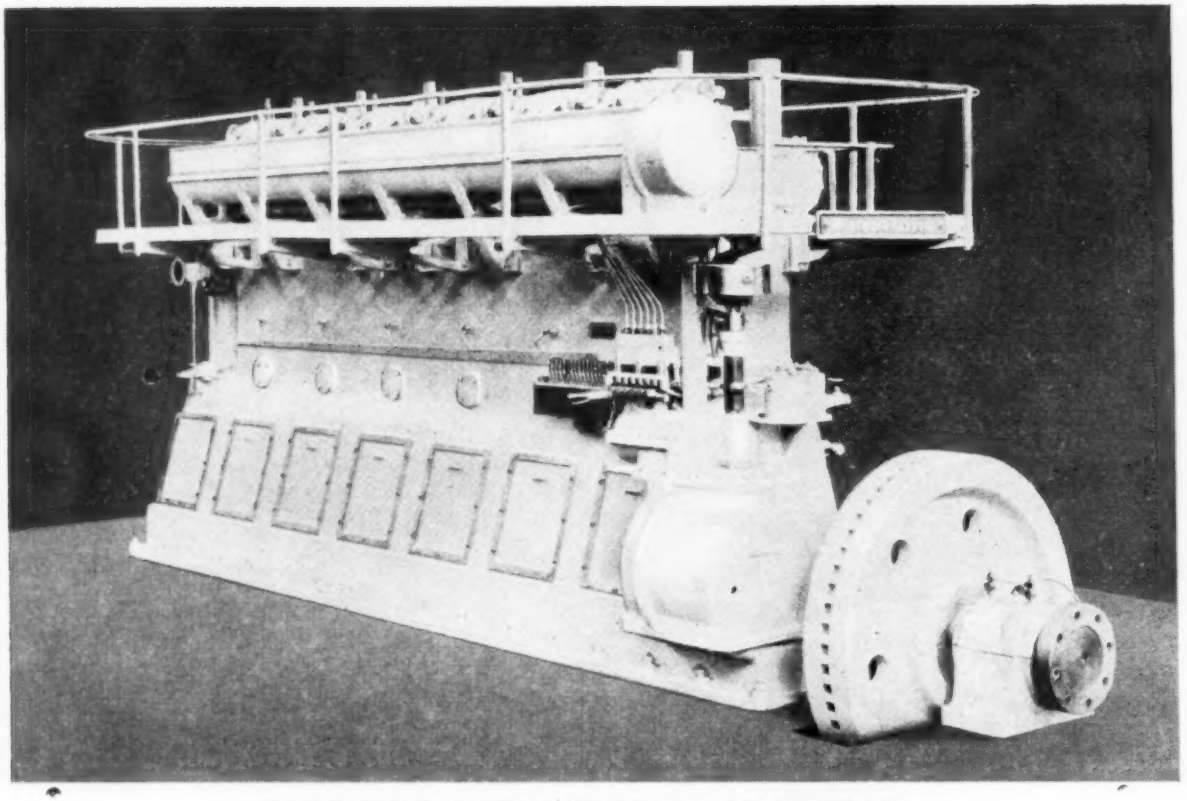
ROBERT SCHOONMAKER

Port Washington Long Island, N. Y.

Roslyn 1600

ALCO DIESELS

8600 HP—10 UNITS
ONE OR ALL—TODAY



SEVERAL IMPORTANT OFFERINGS

7—720 HP Alco Model 8B25—D. C. to 625 KVA 327 RPM—New Complete semi-portable radiator cooled self-contained skid mounted units.

3—1200 HP Alco (McIntosh & Seymour) Diesel Engines—Model 8B40—8 cyl. 20x24—4 cycle—air injection—300 RPM—direct connected to

3—1000 KVA—800 KW Westinghouse—Ideal Generators—3/60/2300-4000 with exciters, switchboards and instruments.

This plant which has had excellent care and good maintenance supervision is complete with all necessary plant auxiliaries.

New in 1930 and 1931.

Offered rebuilt and guaranteed or including complete set of 8 new cylinder liners, pistons, rings and pins with miscellaneous other usable spare parts.

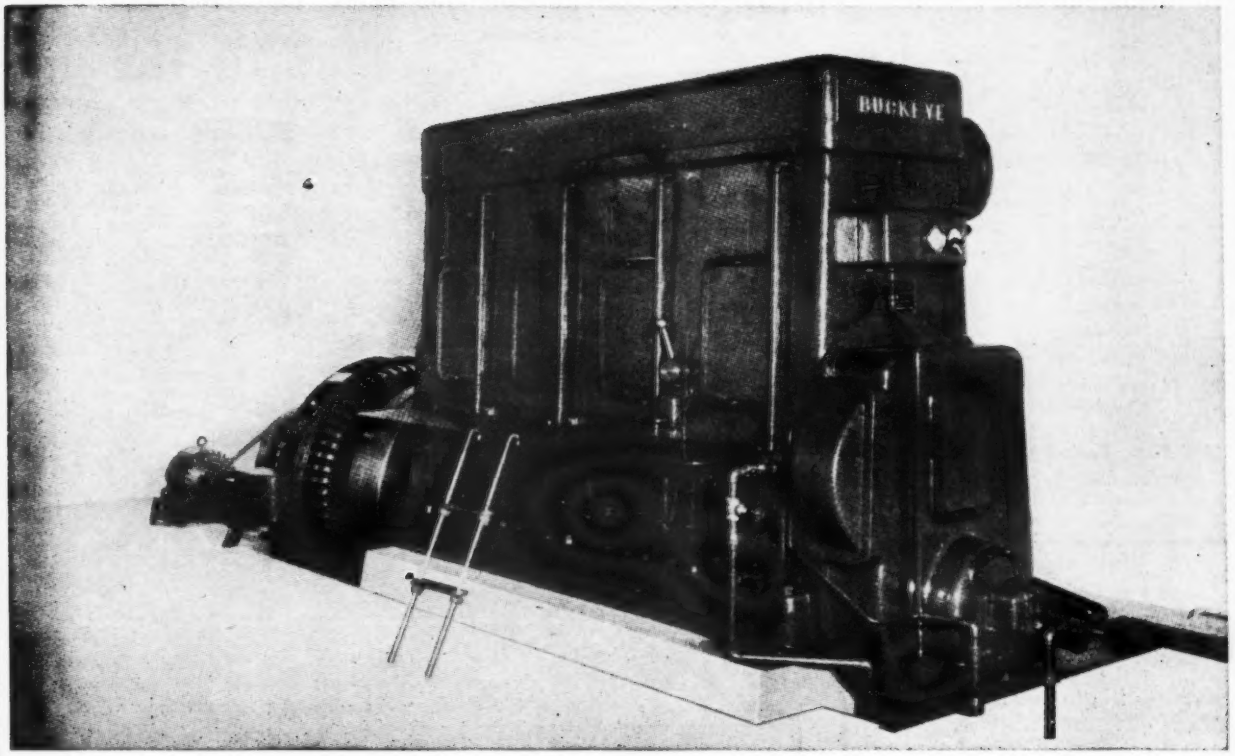
Running Inspection by Appointment

ROBERT SCHOONMAKER
Port Washington, Long Island, N.Y.
Phone Roslyn 1600

BUCKEYE DIESELS

7000 HP—24 UNITS

ONE OR ALL—TODAY



REBUILT AND GUARANTEED

SEVERAL OTHER IMPORTANT OFFERINGS

4	633	Model 80	7 cyl.	10½x12	600 RPM D. C. to 500 KVA—New
4	300	Model 80	5 cyl.	10½x12	600 RPM D. C. to 250 KVA—New
1	290	Model 70	6 cyl.	10 x12	514 RPM D. C. to 250 KVA—1941
1	262	Model E	7 cyl.	9½x14	400 RPM D. C. to 219 KVA—1939
5	225	Model 80	6 cyl.	9½x14	600 RPM D. C. to 200 KVA—New
1	240	Model P	3 cyl.	13½x18	300 RPM D. C. to 187 KVA—1932
1	240	Model P	3 cyl.	13½x18	300 RPM D. C. to 219 KVA—1933
1	190	Model 70	4 cyl.	10 x12	514 RPM D. C. to 150 KVA—1941
1	187	Model E	5 cyl.	9½x14	400 RPM D. C. to 150 KVA—1936
1	150	Model E	4 cyl.	9½x14	400 RPM D. C. to 156 KVA—1939
1	112	Model J	5 cyl.	7½x10½	514 RPM D. C. to 100 KVA—1940
1	150	Model E	4 cyl.	9½x14	400 RPM V belt drive —1936
1	145	Model 70	3 cyl.	10 x12	514 RPM V belt drive —1941
1	112	Model E	3 cyl.	9½x14	400 RPM V belt drive —1936

Running Inspection by Appointment

ROBERT SCHOONMAKER

Port Washington, Long Island, N.Y.

Phone Roslyn 1600

MOTORS — M. G. SETS — CONTROL

In Stock — Immediate Shipment — Rebuilt & Guaranteed

230-VDC. Crane & Mill Motors

	H.P.	Make	Type	R.P.M.
(1)	2½	G.E.	C.O.–1803 (C.P.)	650
(1)	6	G.E.	C.O.–1805	1150
(1)	7½	G.E.	C.O.–1804	720
(1)	7/10	G.E.	M.D.–102 (back axle)	800/1025
(1)	9	G.E.	M.D.–102 (back axle)	975 (C.P.)
(1)	10	G.E.	C.O.–1805	925
(1)	12/16	G.E.	M.D.–103	875/725
(1)	12/16	G.E.	M.D.–102 (back axle)	875/725
(5)	14/19	C.W.	B.W. (back axle)	675/560
(5)	14/19	C.W.	B.W.	675/560
(1)	15	G.E.	C.D.–83	750
(1)	15	Westghse	H.K.–5	700
(1)	15	Westghse	K–5	630
(1)	17	Westghse	MCA–30	600
(1)	20	Westghse	H.K.–6	650
(2)	30/45	G.E.	M.D.–104½ (C.P.)	625/500
(1)	30/45	C.W.	D.W.	620/520
(1)	35	G.E.	C.O.M.–1829 (C.P.)	550
(1)	50	G.E.	C.O.–1829 (C.P.)	650
(1)	52	Westghse	K–10	740
(1)	52	Westghse	K–10 (back axle)	740
(2)	50	G.E.	M.D.–105	475
(1)	50	G.E.	M.D.–105 (back axle)	475
(3)	50/65	Westghse	MCB–60	475/425
(1)	50/65	Westghse	MCA–60 (C.P.)	500/460
(2)	54/80	C.W.	F.W.	575/480
(3)	70/90	Westghse	MCB–70	440/400
(1)	65	G.E.	C.O.–1811 (C.P.)	800
(2)	70/90	Westghse	MCA–70 (C.P.)	475/430
(1)	100	G.E.	C.O.–1831 (C.P.)	550
(1)	150	Westghse	RWY–96 (C.P.)	550

(All above series wound except where C.P. compound wound)

230-VDC, Series Wound Armatures

1—G.E. C.O. 1804; 1—C.O. 1809; 1—C.O. 1811; 2—Westghse K-2; 1—K-7; 1—K-9.

MOTOR GENERATOR SETS

1—200 K.W., 250-275 V DC. Allis Chalmers, factory built set with 288 HP. Syn. motor, 80% P.F., 440/3/60 cy. A.C. & D.C. panel, O.C.B. & starting equipment.

1—17 K.W., 250 V DC. Electric Dynamic Generator, 25 HP. Westghse SQ. CG. motor, 1800 RPM., 220/440 V., 3-Ph., 60-CY. & motor comp.

1—750 KVA., G.E. Syn., condenser 550/3/60 cy., 722 amp., 900 RPM., starting panel, 2—O.C.B., voltage selector, all necessary relays, and meters.

230-VDC. Reversing Drum Controllers

QU.	H.P.	MAKE	TYPE
1	2½	P&H	VC-1
1	5	P&H	HC
1	10	Westghse	116798-B
1	15	C.H.	Z-40116
1	15	G.E.	B-113D (Dyn.)
1	20	G.E.	R-171-A
1	15	EC&M	Dinkey V-2
1	10	Westghse	C18300–8303
2	25	EC&M	Dinkey-V-2
1	30	C.H.	C-2
2	40	EC&M	Dinkey-V-2
1	50	EC&M	Drum (Dyn)
1	50 (new)	Euclid	D-802875 (Dyn.)
1	50	G.E.	R-164-A
1	50	G.E.	R-156-P
8	35/50	G.E.	R-177-A

(6 to 8 BANKS RESISTANCE WITH EACH)

ELECTRIC BRAKES (230 VDC.)

QUA.	H.P.	MAKE	TYPE	WHEEL
1	5	C.H.	Series	8" x 3"
1	6	C.H.	TKI-#8	
1	30	G.E.	CR-9510	11" x 5"
1	30	G.E.	CR-9511	12" x 5"
1	30	Westghse	D.I.	
1	50 (new)	Clark	Series	18" diam.
2	100	Clark	Shunt	24" diam.

VARIABLE SPEED MOTORS 230-VDC.

	H.P.	Make	Type	RPM.
(1)	3	G.E.	RLC-111 (SH.)	500/1500
(1)	3	G.E.	CR-3	500/1500
(1)	3 (Drip-proof B.B.)	Reliance	14T (SH.)	1200/3600
(1)	5	G. E.	RLC-115 (SH.)	250/1000
(1)	5	G. F.	RF-9 (SH.)	450/1350
(1)	5	Westghse	SK-33 (SH.)	1150/1650
(1)	6	G. E.	RF-9 (SH.)	450/1350
(1)	7½	Reliance	78T (SH.)	300/1200
(1)	7½	G. E.	RF-10A (SH.)	450/1350
(1)	7½	Westghse	SK-70	600/1800
(1)	7½	Westghse	SK-70	600/1000
(1)	7½	Westghse	SK-60L (C.P.)	650/1300
(1)	7½	Westghse	SK	850/1700
(1)	8	Westghse	SK-100L (SH.)	300/1200
(1)	8½	G. E.	RF-9 (SH.)	600/1800
(1)	10(115-V.)	Elec. Dy.	7½-S	250/1000
(1)	10	Westghse	SK-80L	800/1500
(1)	10	G. E.	CD	850/1250
(1)	10/15(new)	Allis-Ch.	EB-100 (SH.)	575/1725
(1)	10	Westghse	SK	600/1500
(1)	12	Westghse	SK	600/900
(1)	15	Westghse	SK (SH.)	400/1600
(1)	15	Westghse	SK-100L	450/1500
(1)	15	Reliance	131-T (SH.)	500/1500
(1)	19	Westghse	SK-100L(C.P.)	600/1200
(2)	20	G. E.	RLC	600/1200
(1)	20	G. E.	RLC-702	250/1000
(1)	20	Triumph	Comp.	250/1000
(1)	20	Westghse	SK	650/2200
(1)	25	G. E.	CD-128Y(SH.)	200/800
(1)	25	G. E.	RF-13 (SH.)	400/1200
(1)	25	Reliance	F-3 (C.P.)	500/1500
(1)	30	Westghse	SK-163 (SH.)	400/1200
(1)	35	Westghse	SK-160 (C.P.)	500/750
(1)	45	Reliance	310-T (SH.)	500/1500
(1)	50/60	G. E.	RLC-205 (SH.)	400/1200

2—150 HP., Electro Dynamic Variable Speed, 3-bearing, Frame 75-S, Comp. Interpole, 250/500 RPM., 2 hrs. 185 HP., with Monitor Control Panels, built in Resistance, Auto 4-step acceleration, non reversing, P.B. control.

Constant Speed 230-VDC. Motors

	HP.	MAKE	TYPE	RPM.
(2)	2	Al.-Ch.	E-50	1750 SH.
(1)	3	Reliance	T-224	3500 SH.
(1)	3	G.E.	CD-55	1150 SH.
(1)	5	Westghse	SK-33	1150 SH.
(2)	5	Westghse	SK-40	850 SH.
(1)	5	G.E.	RC-27A	1150 SH.
(1)	5(new)	Al.-Ch.	EB-65	1750 SH.
(2)	7½	Westghse	SK-60	850 C.P.
(5)	7½	Westghse	SK-43	1150 SH.
(1)	7½	Westghse	SK-5L	550 C.P.
(1)	7½	Westghse	SK-40 (115-V.)	1150 SH.
(1)	10(new)	Al.-Ch.	EB-80	1150 SH.
(1)	10	Westghse	SK-50L	1300 SH.
(1)	15	Al.-Ch.	Shunt	800
(1)	15	Westghse	SK-100L	850 SH.
(1)	15	C.W.	CCM	800 C.P.
(2)	20(new)	Elec. Dy.	182N (Enc.) †B.B.)	1500 C.P.
(1)	25	Westghse	SK-100L	1100 SH.
(1)	30	G.E.	DLC-201	1100 SH.
(1)	35	Westghse	SK-130	850 SH.
(1)	50	Westghse	SK	1700 SH.
(1)	75	Reliance	T	875/1200 C.P.

SQUIRREL CAGE MOTORS

220/440-V., 3-PH., 60-Cy.

	HP.	MAKE	TYPE	RPM.
(3)	5 (B.B.)	F.M.	H Frame-D(2-PH.)	900
(1)	7½	G.E.	KT	840
(2)	7½ (B.B.)	F.M.	H Frame-D(2-PH.)	900
(2)	10	Burke	EM-2 (2-PH.)	600
(1)	15	G.E.	KT	1745
(1)	15	Westghse	CCL	1740
(1)	15	G.E.	KT	3500
(1)	20	G.E.	KT-364	1750
(1)	20	Westghse	CS	1160
(1)	25	Westghse	CS	900
(1)	25 (B.B.)	F.M.	H-12-B	900
(1)	25 (B.B.)	F.M.	H-12-A	1200
(1)	25/12½	Westghse	CS-404	1730/880
(1)	25	Burke	2-Phase	1800
(1)	25	Century	AS-30 (2-PH.)	1155
(1)	25	Burke		1200
(1)	30	Westghse	CS	1800
(2)	30	G.E.	K	1750
(1)	30	Burke		900
(1)	40	Westghse	CCL	850
(3)	50	Westghse	CS	850
(1)	50	Westghse	CCL	680
(1)	75	Westghse	CCL	850

SLIP RING (Constant Duty)

3-PH., 60-Cy.

	H.P.	Make	Type	R.P.M.
(1)	3	G.E.	M.Q.-1801 (2-PH.)	1080
(2)	7½	G.E.	MT-201 (550-V.)	1200
(1)	10	G.E.	I.Q. (220-V. 2-PH.)	1120
(1)	20	Westghse	C.W. (220/440-V.)	900
(1)	38	G.E.	I (220/440-V.)	1200
(1)	100	G.E.	I (440-V.)	865
(1)	125	Lincoln	IXS (440-V.)	720
		(A len Bradley Control)		
(1)	250	Westghse	C.W. (440-V.)	435
(1)	300	G.E.	MT-568 (2200-V.)	720
(1)	500	Westghse	H.F. (2200-V.)	360
(1)	600	G.E.	MT-412X (2200-V.)	719
(1)	750	G.E.	MT-414V (2200-V.)	709
		(Above 2 motors have G.E. control CR-2016)		
(1)	1200	Al.-Ch.	ANY (6600-V.)	300
		(Primary & secondary liquid slip control)		
(2)	2500	G.E.	MT (6600-V.)	257
		(With primary & liquid slip secondary control)		

SLIP RING MOTORS (Crane Type)

220/440-V., 3-PH., 60-Cy.

	H.P.	Make	Type	R.P.M.
(3)	2	G.E.	MTC-5140	1200
(1)	2	G.E.	MTC 5140 (550-V.)	1200
(3)	3	P&H	HEW 2 (550-V.)	1620
(1)	5	G.E.	MTC-5200	900
(1)	7½	Star	AHS-47 (2-PH.)	1100
(1)	10	G.E.	MTC-5201	1200
(1)	11	Louis-Allis	Crane	1200
(2)	11	G.E.	ITC-5008	820
(1)	15	Elec. Dy.	F.R.-1601 BAL (2-PH.)	1145
(1)	15	G.E.(Encl.)	MTC-5302Y	830
(1)	25	G.E.(Encl.)	MR'01Z (NEW)	1165
(1)	25	G.E.	MTC 5523 (25-CY.)	680
(1)	27	G.E.	ITC 5012 (25-CY.)	500
(1)	35	Westghse	CI (2-PH.)	720
(1)	35	G.E.(Encl.)	MTC-5336Y	550
(2)	37	G.E.	ITC 5011 (25-CY.)	700
(1)	37	G.E.	ITC 5011	1200
(1)	50	G.E.	MTC 5537 (25-CY.)	690
(1)	50	Westghse	CI-6440	870
(1)	80	G.E.	MTC-5547 (25-CY.)	715
(1)	200	Westghse	MW	580

ELECTRIC BRAKES

220/440-V., 3 PH., 60-Cy.

	H.P.	Make	Type	Wheel Size
(1)	10	G.E.	CR-9510	7" x 3½"
(1)	15	G.E.	CR-9510	6¾" x 3½"
(1)	20	Westghse	A-1	10" x 4"

T. B. MAC CABE COMPANY.

4312 CLARISSA STREET PHILADELPHIA, PENNA.

.....you don't have to wait twenty-eight months--

.....you can get delivery now--

.....you can install and obtain the operating economies you've been planning--

(There is reputable power apparatus available)

These turbo-generators are sound.

1000 KW Extraction Condensing Unit 200# 100° extraction 15# adapts to 22# gauge
500 KW EHNC (Wemco) built 1932 60 cycle, 3 phase, 2400 volts
500 KW NC 1 Curtis Wheel 16 rows Parsons blading—will take 250# 600° TT 30# Ga. B.P.
5000 KW Topping unit 450# 750° T. T. Fairly modern—good shape.
4000 KW Extraction Condensing Unit 350# 650° 5# to 35# Ga. B.P. (Up to 55# on increased P.F.)
5000 KW (Wemco 76 CW) okayed for 250# 600° (looks pretty near new inside)
3 unit plant 30,000 KW 450# 750° T. T. (Topping unit takes 450#)

There are a few freq's (60/25 cycles--true)

One 500 KW, a couple 1500's, a couple 3000's.

These boilers have been checked for internal integrity.

4—350 HP B&W Stirlings built '32 200# stokers, auxiliaries, etc.
2—329 HP Union Iron Lowhead built '37 200# stokers, auxiliaries—building—stack
1—500 HP Stirling built '35 200#, stoker
2—617 HP Wickes 3 drum built '30 250# 500° T.T. (Allowed) stokers
2—750 HP B&W Stirlings 250# 125° S.H. stokers

And a few good HRT'S and refactory lined firebox oil field type boilers.

2—150 HP Erie City HRT's 125# Allowed—stokers . . . 4—120 HP 200# Oil Field—built 1928
2—150 HP 350# (N.B.) Oil Field built 1945 . . . 3—110 HP 200# Kewanee (N.B.) built 1928

And, we believe this is the soundest offer in the country.

2400 KW 400# 750° T.T. 3600 RPM—Will rewind to your voltage—Built '43—Surface condensers, etc. 6000 KVA of these units will occupy less space than a pair of older 6250 KVA machines—Ultra modern design—2 UNITS AVAILABLE

Diesel equipment is—at least—timely.....and will be thru '47.
These are sound.

Complete plant—2300 KW—Utility maintenance see Items P and Q 60/3/2400V.
2—575 HP 400 KW McIntosh-Seymour Built '24—Standby maintenance from '31
2—1200 HP 850 KW McIntosh-Seymour Built '29—Standby maintenance from '31
1—300 HP 200 KW Superior 60/3/480 Built since '30 with auxiliaries
1—300 HP 200 KW McIntosh 60/3/2300 Reported good.
2—New 300 HP 200 KW F/M 60/3/240
1—180 HP 120 KW Worthington 60/3/440 with auxiliaries
1—150 HP 100 KW F/M 60/3/2300 Built '27
Plant 2—Wintons Built '36 & '37 85 KW & 95 KW 60/3/240 with auxiliaries
Power Units. 1 new F/M 180 HP 325 RPM; 1—Reconditioned Enterprise 750 HP 327 RPM Built '38; 1 F/M 360 HP 325 RPM Built '28
D.C. unit 300 HP 200 KW Worthington Built '34 250 volts All auxiliaries

PAUL STEWART & CO., INC.

UNION TRUST BUILDING **CINCINNATI 2, OHIO**

Over 50 Years of Service

NEW MOTORS

NEW — 100 HP AND LARGER — NEW

200 hp	G.E. Type M Slip	2200 Volt	1750 RPM
200 hp	A&C Type ART SqC	2200 Volt	900 RPM
300 hp	West. Type CS Sqc	212	587 RPM
4–200 hp	Wag. Type RP2 Sqc	440	1800 RPM
125 hp	G.E. Type IM Slip	440	720 RPM Reb
250 hp	A.C. Type ABN	440	900 RPM
200 hp	G.E. Type	440	900 RPM
100 hp	W Type CS	440	900 RPM Reb
100 hp	G.E. Type FTR 556Y	440	900 RPM
200 hp	G.E. Type	440	720 RPM

NEW — STANDARD OPEN SQUIRREL CAGE 3/60/220-440 B.B. — NEW

Quan.	H.P.	Frame	R.P.M.	Quan.	H.P.	Frame	R.P.M.	Quan.	H.P.	Frame	R.P.M.
10	1	204	1200	5	10	324	1800	5	50	504	1200
10	1	204	1800	5	10	326	1200	14	60	504	1800
17	1½	204	1800	12	15	326	1800	5	60	505	1200
14	1½	225	1200	10	15	365	1200	10	75	505	1800
3	2	224	1800	7	20	364	1800	5	75	5084	1200
5	2	225	1200	11	20	404	1200	6	100	5084	1800
8	3	223	1800	15	25	365	1800	6	100	5084	1200
8	3	254	1200	22	25	404	1200	1	125	5085	1800
15	5	254	1800	10	30	405	1800	1	125	6085	1200
5	5	284	1200	6	30	444	1200	6	150	5085	1800
14	7½	284	1800	5	40	444	1800	4	150	6085	1200
11	7½	324	1200	5	40	445	1200	5	200	6085	1800
				3	50	445	1800	10	200	6085	1200

NEW — TOALLY ENCLOSED FAN COOLED 3/60/220-440 B.B. — NEW

Quan.	H.P.	Frame	R.P.M.	Quan.	H.P.	Frame	R.P.M.	Quan.	H.P.	Frame	R.P.M.
10	1	203	1800	5	10	324	1800	10	50	445	1800
5	1	204	1200	5	10	326	1200	10	50	504	1200
20	1½	204	1800	10	15	326	1800	10	60	504	1800
13	1½	204	1200	6	15	365	1200	2	60	605	1200
7	2	224	1800	6	20	364	1800	6	75	505	1800
10	2	225	1200	9	20	404	1200	10	75	508	1200
21	3	225	1800	8	25	365	1800	10	100	508	1800
6	3	254	1200	8	25	405	1200	4	100	508	1200
5	5	254	1800	6	30	405	1800	2	125	6085	1800
6	5	284	1200	5	30	444	1200	2	125	6085	1200
5	7½	284	1800	5	40	444	1800	14	150	6085	1800
7	7½	324	1200	5	40	445	1200	10	150	6085	1200

NEW — D.C. MOTORS 230 VOLT — NEW

4 — ½	HP	Shunt SL.B	DP	TL204	690/2760	RPM	18 — 2	HP	Shunt BB	DP	225	1150	RPM
5 — ½	HP	Shunt BB	TE	T-224	690	RPM	10 — 2	HP	Shunt BB	DP	224	1750	RPM
21 — ¾	HP	Shunt BB	DP	T-225	690	RPM	3 — 2	HP	Shunt SL	DP	225	1150/2300	RPM
4 — ¾	HP	Shunt SL	DP	T-224	690/2760	RPM	4 — 3	HP	Shunt SL	DP	225	1150/2300	RPM
16 — 1	HP	Shunt BB	DP	T-204	1150	RPM	1 — 3	HP	Shunt BB	DP	225	1750	RPM
1 — 1	HP	Shunt SL	DP	204	1150/2300	RPM	4 — 5	HP	Shunt BB		254	1750	RPM
5 — 1½	HP	Shunt SL	DP	224	1150/2300	RPM	1 — 5	HP	Shunt BB	Semi Enc.	254	1750	RPM
3 — 1½	HP	Shunt SL	DP	224	1150/2300	RPM	2 — 7½	HP	Shunt BB	Open	23-T	1750	RPM
15 — 1½	HP	Shunt BB	DP	225	690/2760	RPM	1 — 10	HP	Shunt BB	DP	34-T	1750	RPM
17 — 1½	HP	Shunt BB	DP	204	1750	RPM	2 — 7½	HP	Shunt BB	DP		400/1600	RPM

NEW — STOCK — COMPENSATORS — STOCK — NEW

50 HP 220–60–3	125 HP 220–60–3	50 HP 440–60–3	125 HP 440–60–3
75 HP 220–60–3	100 HP 220–60–3	75 HP 440–60–3	150 HP 440–60–3
100 HP 220–60–3		100 HP 440–60–3	

SPECIAL — NEW — SPECIAL

50 — 3 HP G.E. 115 V only CAPACITORS
Single Phase 60 Cycle 1750 RPM
150 — ½ HP G.E. BB Nema 440/60/3/3600 RPM
75 — ¾ HP G.E. BB Nema 220/440/60/3/1750 RPM

THE ABOVE SUBJECT TO PRIOR SALE

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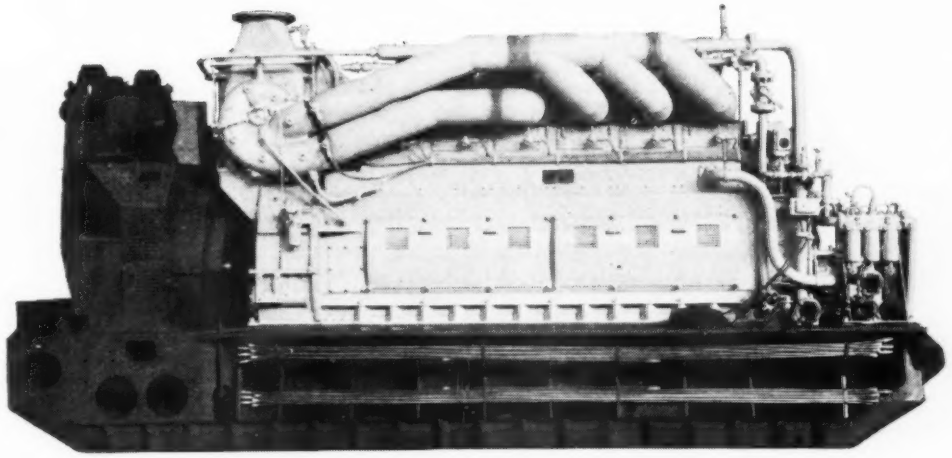
DIESEL POWER



500-600 KVA ALCO DIESEL GENERATOR SET

NEW ALTERNATING CURRENT GENERATOR SETS

500 KVA 3 ph 50 cy. 230/400 v.
600 KVA 3 ph 60 cy. 127/220 v.

•

GENERAL ELECTRIC GENERATOR

600 RPM—50 cycle
720 RPM—60 cycle
Direct connected to
Alco Diesel Engines
Model 540 6 cyl. 4 cycle

OTHER IMPORTANT DIESEL POWER OFFERINGS FROM STOCK

GENERATOR SETS

3 phase, 60 cycle

1500 KW	FAIRBANKS MORSE	2300 V
1000 KW	NELSECO	2300 V
800 KW	McINTOSH & SEYMOUR	2300 V
500 KW	SUPERIOR	2300 V
480 KW	ALCO	127/220 V
350 KW	DE LA VERGNE	2300 V
300 KW	GMC	127/220 V
300 KW	NELSECO	2300 V
260 KW	McINTOSH & SEYMOUR	240 V
250 KW	McINTOSH & SEYMOUR	240 V
250 KW	FAIRBANKS MORSE	2400 V
240 KW	FAIRBANKS MORSE	2400 V
130 KW	FAIRBANKS MORSE	2400 V
125 KW	BUCKEYE	240 V
100 KW	SUPERIOR	240 V
75 KW	BUCKEYE	240 V
50 KW	INTERNATIONAL	127/220 V
30 KW	INTERNATIONAL	127/220 V
15 KW	INTERNATIONAL	127/220 V

PORTABLE POWER UNITS

160 HP	MURPHY	1200 RPM
150 HP	BUDA	1200 RPH
130 HP	CATERPILLAR	1000 RPM
100 HP	INTERNATIONAL	1200 RPM
65 HP	INTERNATIONAL	1200 RPM
60 HP	FAIRBANKS MORSE	1200 RPM
43 HP	INTERNATIONAL	1200 RPM
30 HP	INTERNATIONAL	1200 RPM
18 HP	LISTER	1200 RPM
15 HP	GENERAL MOTORS	1200 RPM

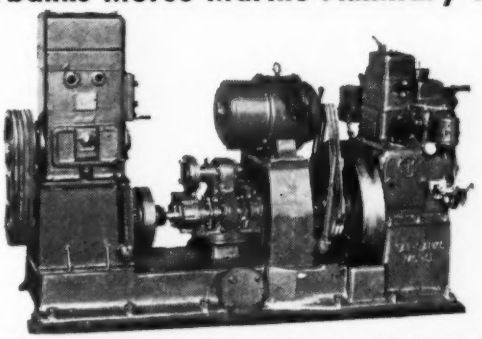
GENERATOR SETS

Direct Current

275 KW	COOPER BESSEMER	250 V
60 KW	GMC	120 V
60 KW	BUDA	120 V
15 KW	HILL	250 V
15 KW	HILL	120 V

SPECIAL OFFERING!

Fairbanks Morse Marine Auxiliary Set



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ADVISE US OF YOUR POWER REQUIREMENTS

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THE PICK OF POWER EQUIPMENT

TURBINE UNITS—60 Cy.

1—22500 KW General Electric Cond.
1—15300 KVA Westinghouse Cond.
1— 7500 KVA General Electric Cond.
1— 5000 KVA General Electric Cond.
1— 3750 KVA Westinghouse Extrac.
1— 3125 KVA Westinghouse Cond.
1— 2500 KVA General Electric Cond.
1— 1563 KVA Westinghouse Extrac.
1— 1250 KVA General Electric Extrac.
1— 937 KVA General Electric Cond.
1— 375 KVA General Electric Cond.
1— 6250 KVA Allis Chalmers Topping

D. C. TURBO UNITS

1—250 KW Westinghouse, 120/240 V.
1—125 KW General Electric, 125 V.
1— 75 KW General Electric, 125 V.
1— 50 KW Westinghouse, 125 V.

STEAM ENGINE UNITS—60 Cy.

1—625 KVA Ames Uniflow
2—480 KVA Skinner Uniflow
1—375 KVA Harrisburg Uniflow
1—325 KVA Skinner Uniflow
1—300 KVA Skinner Uniflow
1—150 KVA Ames Uniflow

D. C. STEAM ENGINE UNITS

1—400 KW Ridgway 4-valve 275 V.
1—350 KW Ridgway Uniflow 250 V.
1—300 KW Skinner Uniflow 275 V.
1—250 KW Ames Uniflow 250 V.
2—125 HP Ridgway 4-valve 250 V. 3-wire

DIESEL ENGINE UNITS

1—625 HP Worthington, 240 V. 60 cy. gen.
1—440 HP Nordberg, 250 V. gen.
2—410 HP DeLaVergne, 4000 V. 60 cy. gen.
2—400 HP LeRoi RX1SV (gasoline) eng. only
1—375 HP McInt. & Say., 240 V. 60 cy. gen.
1—300 HP McInt. & Say. 480 V. 60 cy. gen.
1—270 HP DeLaVergne, 4000 V. 60 cy. gen.
2—250 HP Gen. Motors, 460 V. 60 cy. gen.
1—150 HP Buckeye 400 RPM engine only
2—125 HP Winton, 240 V. 60 cy. gen.

WATER TUBE BOILERS

2—1373 HP B. & W. 230-lb., Oil Fired
1—1320 HP Springfield 400-lb., Pulverizer
1— 760 HP Stirling 250-lb., Stokers
2— 617 HP Wickes 250-lb., Bent Tube
1— 607 HP Wickes 250-lb., Stoker
6— 600 HP B. & W. 200-lb., Stokers
2— 600 HP Springfield 200-lb., Stokers
2— 560 HP Erie City 460-lb.
5— 492 HP Heine 180-lb., Stokers
2— 481 HP Springfield 225-lb., Pulverizer
2— 323 HP Springfield 225-lb., Stokers

SYNCHRONOUS MOTORS

1—600 HP G.E. 60 cy. 2200 V. 600 RPM
1—500 HP Al. Ch. 60 cy. 2300 V. 450 RPM
1—375 HP G.E. 60 cy. 2300 V. 1800 RPM
1—300 HP G.E. 60 cy. 2200 V. 1800 RPM
2—250 HP G.E. 60 cy. 2200 V. 225 RPM
1—200 HP Ideal 60 cy. 4000 V. 514 RPM
1—100 HP G.E. 60 cy. 300 V. 240 RPM (Super)

INDUCTION MOTORS—60 Cy.

1—1000 HP West. slip ring 2200 V. 360 RPM
1— 300 HP West. slip ring 440 V. 1200 RPM
2— 120 HP G.E. sq. cage 220 V. 3600 RPM

MOTOR GEN. SETS—60 Cy.

1—1000 KW General Electric 600 V. DC
1— 300 KW Westinghouse 600 V. DC
1— 150 KW General Electric 125 V. DC
1— 100 KW Westinghouse 125 V. DC
1— 50 KW Westinghouse 250 V. DC

ROTARIES—60 Cy.

2—2600 KW General Electric 300 V.
1—2000 KW General Electric 600 V.
2—1750 KW General Electric 250 V.
1—1500 KW Westinghouse 250 V.
1— 500 KW General Electric 250 V.

FREQUENCY CHANGERS

1—2150 KVA G.E. 25/62½ cy. 750 RPM
1—1875 KVA G.E. 25/60 cy. 300 RPM
2—1500 KW West. 25/60 cy. 300 RPM
2—1000 KVA G.E. 25/60 cy. 300 RPM
1—1000 KVA Al. Ch. 25/62½ cy. 375 RPM
1— 938 KVA West. 25/62½ cy. 750 RPM
1— 600 KVA G.E. 60/25 cy. 300 RPM

TRANSFORMERS—1 Ph. 60 Cy.

4— 6667 KVA G.E. 79660/138,000-34500 V.
1— 1500 KVA Pitts. 66000-33000 V. 3 ph.
4— 1500 KVA G.E. 66-13.2/4.6/2.3 KV
3— 750 KVA Pitts. 66000-33000 V.
3— 100 KVA G.E. 66000-6900/11000 V.
2— 7500 KVA G.E. 33000-13800 V. 3 ph.
4— 1500 KVA G.E. 33-13.2/4.6/2.3 KV
3— 150 KVA G.E. 33000-2300 V.
6— 100 KVA G.E. 33000-2300 V.
3— 75 KVA Moloney 33000 2300 V.
40— 50 KVA G.E. 33000-2400 V. New
50— 25 KVA G.E. 33000-2400 V. New
2—10000 KVA West. 26400-4560 V. 3 ph.
1— 600 KVA West. 26400-2300 V. 3 ph.
2— 1000 KVA G.E. 23000/11500-575 V.
1—10000 KVA West. 13200-4560 V. 3 ph.
1— 3000 KVA G.E. 13200-480 V. 3 ph.
3— 600 KVA Moloney 13200-2200 V.
2— 1000 KVA G.E. 11500/23000-575 V.
3— 150 KVA G.E. 4150-220 V. 3 ph.
3— 250 KVA Al. Ch. 2300-230/460 V.

OIL CIRCUIT BREAKERS

1—	400 A. 37 KV G.E. FKO136	Outdoor
2—	1000 A. 30 KV Kelman CB76	"
1—	400 A. 25 KV G.E. FK-136	"
4—	600 A. 15 KV G.E. FHKO139-24BS	"
2—	600 A. 15 KV G.E. FKO37	"
1—	600 A. 15 KV West. Q-221	"
2—	400 A. 15 KV G.E. FHKO136	"

PARTIAL LIST—WE HAVE ALL CLASSES OF POWER EQUIPMENT

BREW, WOLTMAN & CO., INC.

50 Church Street — New York City 7, New York

ELECTRICAL EQUIPMENT

REBUILT AND GUARANTEED—PROMPT SHIPMENT

MOTORS - GENERATORS - MG SETS - TRANSFORMERS - CONTROLS

SPECIAL OFFERINGS

VARIABLE VOLTAGE DRIVES

10—40 HP, General Electric Variable Voltage Ward Leonard Drives consisting of:
1—40 KW, 250 Volt, Induction M-G Set, with two auxiliary 5 KW generators with exciters.
1—40 HP, 250/1500 RPM, Type CD-1441 DC Motor.
2—Auxiliary, 5 HP, 1750 RPM Type B-284, DC Motors.
1—Enclosed magnetic control providing jog forward, jog reverse, run, fast, slow, and stop. Complete with motor operated field rheostat

NEW G. E. SPLASHPROOF AC MOTORS
50°C., 50 Cycle, 220/380 Volts

Quantity	HP	Speed	Type
18	3	1410	K-225
6	3	1400	K-225 with motor mounted disc brake

NEW 500 VOLT ADJUSTABLE SPEED D.C. MOTORS

Qu.	H.P.	Speed	Make	Type
4	7½	450/1800	G.E.	CD-85 (1 Hr.)
4	60	400/1600	G.E.	CD 1446-AL (1 Hr.)

NEW 25—Allis-Chalmers, 10 H.P., 1200 RPM, 230 Volt, D.C., EB-80, Dripproof, 40°, Ball Bearing.

NEW
1—200 HP, 2960 RPM, 3 phase, 50 cycle, 500 Volt, Westinghouse Type CS-8120 TEFC
2—250 HP, 296 RPM, 3 phase, 50 cycle, 220/380 Volt, (or 360 RPM, 3 phase, 60 cycle, 440 volt) Westinghouse Wound Rotor Type CW-20-53-15
1—700 HP, 1484 RPM, 3 phase, 50 cycle, 6300 Volt, Westinghouse Type CS-4-39D-12

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NEW and USED

All makes & sizes for prompt shipment several attractive assorted sizes.

SPECIAL OFFER
400-HP . . . 175 lbs. Stirling Boilers

3—250 HP Heine Water Tube Type

J. F. DAVIS CO.

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Telephone Harrison 0755

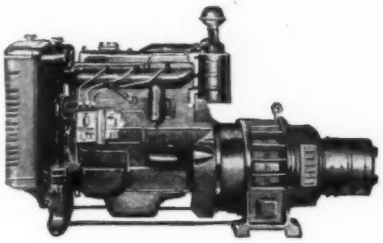
DIESEL ENGINES AND GENERATORS

450 H.P. used Fairbanks-Morse engine, model 33 D-14 with direct connected 300 K.W. generator A.C. Complete unit.
300 H.P. used Fairbanks-Morse engine, model VA with direct connected 200 K.W. generator A.C. Complete unit.
275 H.P. used Atlas Imperial engine, model 8-ES with direct connected 175 K.W. generator A.C. Complete unit.
50 K.W. new Clark engine, skid mounted, direct connected generator. Complete unit.
80 H.P. used Chicago Pneumatic engine, model RH-40, direct connected 55 K.W. generator A.C. Complete unit.

Immediate Delivery

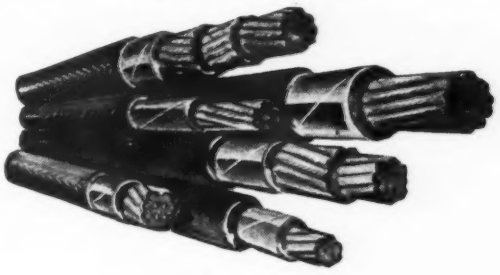
DENNY & CLARK

910 N. Marshfield Ave., Chicago, 22, Illinois



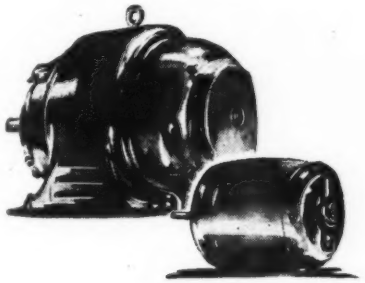
GENERATORS

If unit power generation is your problem, it will pay you to check our large lists of this type of equipment. We have gasoline, steam, Diesel and electric driven generators—(and generators without prime movers) in a wide range of load and voltage characteristics, in both a-c and d-c.



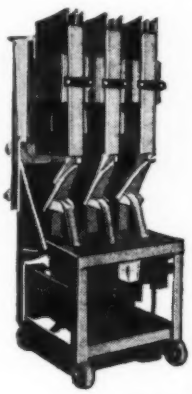
WIRE & CABLE

Our inventory includes an innumerable variety of wire and cable in sizes and insulations usable in industry. Many types conform to underwriters' specifications—others were made for special purposes but are adaptable to industrial and commercial applications.



MOTORS

We have a large supply of electric motors, both a-c and d-c, in unusual speeds, voltages and loads. If you have applications in which these motors can be adapted, inquire at your nearest Regional Office for full particulars and prices.



SWITCH GEAR

Special items in this category are now available if you can use them. Check your requirements and avail yourself of this opportunity to purchase switch gear at considerable savings. Consult your nearest W. A. A. office for description, location and prices.

STANDARD AND SPECIAL ELECTRICAL EQUIPMENT

FOR SALE

priced for immediate disposal

The War Assets Administration offers you government-owned surplus electrical machinery and equipment for your reconversion program at *substantially reduced prices.*

The offer includes wire and cable, generator sets, transformers, switch gear, wiring devices, sub-station power conversion and protective equipment. Much of it is special but adaptable to a large variety of uses.

It has been *priced to sell* and represents attractive bargains to the alert and resourceful industrialist engaging in speedy reconversion.

(Cut out and send to the nearest WAA office listed below)

War Assets Administration: I am interested in the following checked items:

- ☐ *WIRE & CABLE*
- ☐ *GENERATORS*
- ☐ *SWITCH GEAR*
- ☐ *SPECIAL ELECTRIC MOTORS*
- ☐ *WIRING DEVICES*
- ☐ *POWER CONVERSION EQUIPMENT*
- ☐ *SUB-STATION EQUIPMENT*
- ☐ *PROTECTIVE EQUIPMENT*

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Firm.....

Address.....

City..... State..... 319-1

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OFFICES LISTED BELOW ARE TEMPORARILY IN RECONSTRUCTION FINANCE CORPORATION AGENCIES

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VETERANS OF WORLD WAR II: To help you purchase surplus property, a veterans' unit has been established in each WAA office.

Write—Wire—Phone

us if you don't see the item you need. This listing is only a part of our large stock.

M-G SETS

500 KW Gen. Elec. type MPC gen. DC 170 volts 1760 amp. coupled to 450 HP G.E. MPC motor DC 250 V. 1150 RPM (can furnish A.C. drive).
100 KW Gen. Elec. 3 brg. unit, type RC gen. DC 125 v. coupled to 150 HP sq. cage 1-K motor 3-60-2200/4000 V.—1200 RPM.
50 KW Cr. Wheeler type CC generator DC 125 V. coupled to 80 HP C-W motor sq. cage 3-60-220/440 V. 1800 RPM.
40 KW Martin rotary converter, input 3/60/220 v., output DC 230 v., with panel.
37½ KVA Whse. AC gen. 3/60/240 V. coupled to 50 HP Whse. SK motor DC 230 V. 1150 RPM, 3 brg. Like new.
35 KW Gen. Elec. DLC gen. DC 250 V. to 50 HP AC motor 3-60-220/440 V.
30 KW Gen. Elec. CD 103 gen. DC 60 v. 500 amp. coupled to 45 HP G.E. KT 532 motor 3-60-220/440 v. 1600 RPM, late style 3 brg. unit.
Others available—special units built to order.

D. C. MOTORS

H.P.	Mfg.	Type	Volts	Speed
450	Gen. Elec.	MPC	230	1150
100	Gen. Elec.	DLC	230	1050
75	Whse.	SA	230	900
75	Whse.	813	125	475
75	Gen. Elec.	DLC	230	400
60	Diehl dynamom	R10	250	500/2000
50	Whse.	SK	230	1150
50	G.E. Sprague	LC	250	700
50	Whse.	SA	230	450/1350
40	Gen. Elec.	DLC	230	750
40	Roth	S	115	850
40/50	Reliance (3) b.b.	310T	230	600/1800
40	Whse.	SK	230	1700
30	Sprague	dynamom	250	800/2000
25	Gen. Elec.	DLC	115	750
25	Roth	elevator	230	725
25	Whse. enclosed	SK	230	600
25	Whse.	SK	230	950
25	Sprague dyna.	LC	115	700/1500
25	Gen. Elec.	RC32	230	800
25	Star b.b.	SB15	230	1750
22	Whse. crane	K-6	230	1050
20	Imperial Int. dty.	D37	230	1200
20	Gen. Elec.	LC	230	575
20	Gen. Elec.	DLC	230	500/1500

SQUIRREL CAGE MOTORS

3 Phase—60 Cycles—220 or 440 Volts

Qua.	H.P.	Mfr.	Type	Speed
1	300	Gen. Elec.	I-K	1800
1	200	G.E. 2200V. 3brg.	I-K	600
1	200	F.M. b.b. 2200 v.	H	1800
3	165	Gen. Elec.	I-K	1800
1	150	G.E. 2200 v.	I-K	720
1	75	Gen. Elec.	I-K	720
1	60	Gen. Elec.	I-K	1200
1	60	Howell	SC	1200
2	60	Gen. Elec.	I-K	3600
1	50	Gen. Elec.	I-K	1200
1	50	Gen. Elec. vertical	KT	1200
2	50	Gen. Elec.	I-K	900
1	40	Allis Ch.	AN	1200
1	40	Gen. Elec.	I-K	900
1	30	F. Morse b.b.	Q405	1800
1	30	Gen. Elec.	I-K	720
1	30	Allis Ch.	AN	900
2	25	Allis Ch.	AN	900
2	25	Allis Ch.	AN	1200
2	25	Gen. Elec.	I-K	1800
1	25	Gen. Elec.	I-K	600
2	20	Gen. Elec.	I-K	1200
1	15	Gen. Elec.	I-K	720

25 CYCLE MOTORS

H.P.	Mfg.	Type	Speed
450	Whse. 2200 v.	CW sl. rg.	750
150	Whse.	HD sl. rg.	500
150	Gen. Elec. 2200 v.	MT359 sl. rg.	1500
100	Whse.	CCL sq. cg.	500
50	Allis Ch.	ANY sl. rg	1500

SYNCHRONOUS MOTORS

H.P.	Mfg.	Type	Volts	Speed
750	Allis Ch.		220/440	1200
500	Elec. Machy.	Late	2200	514
350	Gen. Elec. 3 brg.	ATB	220/440	600
300	Whse.	ped.	220/440	900
250	Gen. Elec.	AT1	220/440	514
90	Gen. Elec.	AT1	220/440	1200
75	Ideal	SMS	220/440	1200
40	Gen. Elec. 8 PF	TS	220/440	900

CENTRIFUGAL PUMPS

8" Alberger, 2000 gpm @ 80 ft.
6" Platt, 1000 gpm @ 230 ft.
8" Worthington, 2000 gpm @ 200 ft.

SLIP RING MOTORS

3 Phase—60 Cycles—220 or 440 Volts

Qua.	H.P.	Mfg.	Type	Speed
1	350	Whse. v.	CW 2200	720
1	300	Burke	EMV	225
1	250	Cr. Wheeler	SR	600
1	150	Whse.	HF	600
1	75	Gen. Elec.	MT537	1800
1	75	Gen. Elec. 2200 v.	I-E13	1800
1	60	Whse. 2200 v.	CW657	1800
1	60	Gen. Elec.	I-M	720
1	50	Gen. Elec.	I-M	600
1	40	Gen. Elec. 2 ph.	MQ536	900
1	40	North'n	HW35A	1200
2	40	Gen. Elec.	MT532	1200
1	40	Fair Morse b.b.	HV	900
1	40	Whse.	CW	900
2	40	Gen. Elec.	M546	514
2	40	Allis Ch.	ANY	450
1	40	G.E. 550 v.	MT536	900
1	35	Fair. Morse b.b.	HV	1800
3	35	Lancashire b.b.	late	1800
1	30	Northw'n. b.b.	HW404	1800
2	30	Allis Ch.	ANY	900
1	25	Gen. Elec.	I-M	1200
1	25	Wagner	19TBR	1200

D. C. GENERATORS

KW	Mfr.	Type	Volts	Speed
300	Gen. Elec. 1 brg.	MPC	125/170	1150
100	Gen. Elec.	DLC	250	1200
75	Whse.	S	125	600
60	Whse.	SA	250	1200
60	Gen. Elec.	DLC	250	450
50	Cr. Wheeler	CC	125	1800
60	J&L	cpd.	250	750
35	Gen. Elec.	DLC	250	900
30	Gen. Elec.	CD113	250/125	900
30	Lincoln b.b. 600 amp.		50	1200
25	Gen. Elec.	DLC	125	900
25	Gen. Elec.	RC	250	900
25	Whse (3) b.b.	SK113	250	1800
20	Allis Ch. (2)		125	475
16	Cr. Wheeler	CCD	125	415

ALSO IN STOCK . . . OIL SWITCHES
BLOWER & FAN . . . SPEED REDUCERS . . . 500 NEW MOTORS

60 CYCLE A.C. GENERATORS

KVA	Mfr.	Type	Volts	Speed
300	Whse.	ped.	240/480	900
300	Elec. Machy. 3 brg.		240/480	720
200	Gen. Elec.	ATB	2300	600
150	Allis Ch.		2300	900
150	Allis Ch. 25 cycle		240/480	500
100	Cr. Wheeler	ped.	240/480	600
75	Gen. Elec.	ATB	240/480	1200
75	Ideal	SM	240/480	1200
10	Whse. (5) NEW	b.b.	240	1200

ARTHUR WAGNER COMPANY

1436-38 W. RANDOLPH STREET — CHICAGO 7, ILL. — MONroe 7409

POWER PLANT EQUIPMENT

Special Offerings

TURBO-GENERATORS

1—3000 KW. 2300 V. Cond.
1—2500 KW. 2300 V. Cond.
1—1250 KW. 2300 V. Cond.
1— 250 KW. 240 V. N. C.
1—2000 KW. 600 V. Cond.
2—1000 KW. 2300 V. Cond.
2—600 KW. 4000 V. Cond.
1—500 KW. 440 V. N. C.
1—500 KW. 125 V. D. C.
1—375 KW. 440 V. Cond.
1—120 KW. 440 V. N. C.

ENGINE GENERATORS

1—540 KW. Uniflow 480 V.
1—150 KW. 480 V.
1—600 H.P. Uniflow Eng.
1—168 KW. 550 V.
2—280 KW. 440 V.
1—600 KW. 2300 V.

TURBINES ONLY

1—375 H.P. with gears
1—210 H.P. Terry 250#
1—100 H.P. G.E. with gears

BOILERS

1—1390 H.P. 400# Coal
1— 990 H.P. 200# Coal
1— 620 H.P. 200# Coal
3— 500 H.P. 160# Coal
1— 360 H.P. 190# Coal
2— 310 H.P. 250# Coal
2— 100 H.P. 100# Oil
2— 175 H.P. 200# Oil
1— 200 H.P. HRT 160#
5— 150 H.P.HRT 125#

MOTOR

1—200 H.P. Syn. 220 V.

AIR COMPRESSORS

2—3400 CFM 100# Motor
1—3000 CFM 100# Motor
1—1972 CFM 100# Motor
1—1573 CFM 100# Motor
2—1228 CFM 100# Motor
1— 511 CFM 100# Belted
1— 490 CFM 100# Belted
1— 600 CFM 350# Steam
1—5000 CFH 600# Belted
1—1000 CFH 3000# Belted

FORCED DRAFT FANS

2—Coppus 28"—15000 CFM at 4" S.P. Turbine Driven New, never used
8—Coppus 26"—11500 CFM at 4" S.P. Turbine Driven condition—good.

Write or wire for additional data and prints.

A. LEE ELLIS CO., U. S. Mchy. Bldg., Boston, Mass.

The Buyer Must Be Satisfied—Always

SYNCH. CONVERTERS

500 KW G.E. 250 D.C. 2300/4000 A.C. 1200 RPM
500 KW AL-CH. 250 D.C. 2300/4000 A.C. 1200 RPM
300 KW G.E. 600 D.C. 2300/4000 A.C. RPM
150 KW WEST. 250 D.C. 2300/4000 A.C. 1200 RPM

MOTOR GENERATORS

300 KW G.E. SYN. 600 V. 2300/4000 A.C. 1200 RPM
150 KW G.E. SYN. 250 V. 2300/4000 A.C. 900 RPM
150 KW WEST. SYN. 600 V. 2300/4000 AC. 1200 RPM

Each unit listed above is owned by us and is available now for immediate purchase

WALLACE E. KIRK CO.

Incorporated

502 Grant Building, Pittsburgh, Pa.

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New or used. All types and sizes. Air and oil cooled. Phase changers a specialty.

ATLANTIC TRANSFORMER CO.
Transformer Specialists
5143 N. 2nd St. Phila., Pa.

IN STOCK
DIESELS

1—1500 HP Electric Boat Company Nelseco Supercharger with direct connected AC Generator
1—750 HP Superior with or without AC Generator
2—375 HP McIntosh-Seymour with AC Generators
2—360 HP Fairbanks-Morse with AC Generators
1—120 HP Fairbanks-Morse with AC Generator
10—75 HP New International Harvester UD-18 with AC Generators
12—65 HP New International Harvester UD 14 with AC Generators
2—45 HP New International Harvester UD-9 diesel power units with clutch and power takeoff
1—35 HP New International Harvester UD-6 diesel power unit
1—30 HP Lister with AC Generator
1—16 HP Lister
1—15 HP General Motors Power unit

MANY OTHER UNITS AVAILABLE

A. G. Schoonmaker Company
Business Established 1898
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TURBO GENERATORS

750 KW., 3 ph., 60 cy., 480V. 3600 Allis Chalmers to a Moore extraction type Turbine with board.

500 KW., 3 ph., 60 cy., 480V. Westgh. non cond. Turbo Generator with board.

937 KVA., 3 ph., 60 cy., 2300V. Gen. Elec. cond. Turbo Generator.

ROTARY CONVERTER

1—1500 KW., 250 V. Westgh. complete.

1—156 KVA., 3 ph., 60 cy., 240 volt Gen. Elec. to an 8 cylinder Buffalo engine only 5 years old, little used.

The above are just a few of the thousands of items we have in Motors, Generators, Turbo Generators, Engine Generators, Motor Generators, Transformers, Circuit Breakers, etc. Please send us your inquiries.

What have you for sale?

KEYSTONE
Power Plant Equipment Company
8493 Hegermen St., Phila. 36, Penna.

STEAM GENERATOR

Erie City Slide Valve 200 KW, 2 Phase, 60 Cycle, 120/240 Volts, type AQB. Complete with switchboard.

Quick Sale $1850.00 on foundation.

ALJON ELECTRIC DIESEL CO.
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BOILERS

2 ERIE CITY longitudinal, box header water tube boilers with Type-E, stokers, 400 H.P. (each) headers are equipped with KEY CAPS—OHIO, PENN'A. & ASME Stamping.

H. P. BREARLEY
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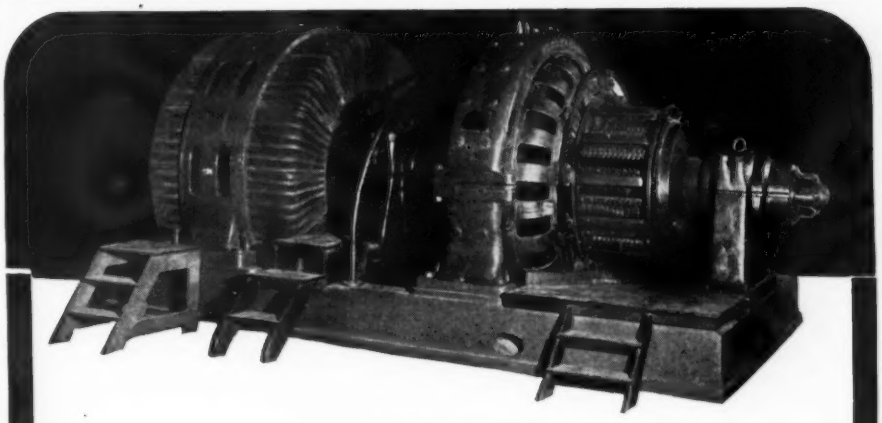

250 VOLT
MOTOR GENERATORS

KW.	Make	Speed	Drive
500	GE	720	60 cy. syn.
400	GE	600	60 cy. syn.
400	GE	1200	60 cy. syn.
300	West	720	60 cy. syn.
200	GE	1200	60 cy. syn.
150	West	850	60 cy. sq. cg.
150	Al.-Ch.	500	25 cy. rot.
125	Hertner	1200	60 cy. syn.
100	GE	1200	3 wire 60 cy.
100	GE	750	25 cy. rot.
75	GE	1200	60 cy. syn.
50	West	1200	60 cy. sq. cg.
40	GE	1800	60 cy. cyn.
25	GE	1800	60 cy. sq. cg.
15	GE	1200	60 cy. sq. cg.
15	GE	750	25 cy. sq. cg.
10	West	900	60 cy. sq. cg.
5	Rel.	1800	New VS
3	Rel.	1800	New VS

125 VOLT MOTOR GENERATOR SETS

KW.	Make	Speed	Drive
200	GE	750	25 cy. syn.
150	West	1200	60 cy. syn.
125		900	60 cy. slip
100	West	1200	60 cy. syn.
75	GE	1200	60 cy. sq.
75	GE	1200	60 cy. sq.
50	Sprague	900	60 cy. sq.
50	GE	750	25 cy. sq.
50	West	750	25 cy. sq.
35	West	750	25 cy. sq.
35	Sprague	750	25 cy. sq.
25	West	1800	60 cy. sq.
20	West		60 cy. sq.
12	GE	1800	60 cy. 3 wire
10	GE	1800	60 cy. 3 wire
5	Reliance	1800	new

Low Voltage and 125 V and 600 V Sets also in Stock

"All equipment rebuilt in our shops and guaranteed on same basis as new equipment."

MOTORS, GENERATORS, TRANSFORMERS, BOUGHT AND SOLD

Wire Inquiries Collect

ELECTRIC EQUIPMENT CO.
TELEPHONES: GLENWOOD 6783-6784-6785
63 CURLEW STREET, P. O. BOX 51 ROCHESTER 1, N. Y.

CHICAGO'S LARGEST STOCK GUARANTEED EQUIPMENT

MOTOR—GENERATOR SETS

KW	Make	DC Volts		AC Volts
750	Elliott	275	Syn.	3/60/440
500	G.E.	600	Syn.	3/60/2300/4000
400	Wte.	275	Syn.	3/60/440
300	G.E.	250	Syn.	3/60/480
225	Ideal	115	Syn.	3/60/2200
200	Elliott	115	Syn.	3/60/480
115	Columbia	45		3/60/440
75	G.E.	250	Syn.	3/60/440
75	G.E.	125	Ind.	3/25/220
75	G.E.	125	Ind.	3/25/440
60	Al. Ch.	110	Ind.	3/60/2300
50	Cr. Wh.	3/60/240 DC		230
20	Bullock	125		3/60/332/440
18	Cr. Wh.	24		3/60/220
15	L. Allis	125		3/60/220/440
15	Columbia	45		3/60/220/440
14	G.E.	125		3/60/220
12½	Sprague	125		Balancer
10	Columbia	45		3/60/440
8½	Al. Ch.	120		3/60/440
7½	G.E.	60	Ind.	3/60/440
6	Cr. Wh.	125		Balancer
5	Ideal	250	DC	230
5	N.W.	3/60/110-220	DC	230
4	G.E.	110		3/60/220
3	Lincoln	110	Ind.	3/60/220
2	Elec. Spec.	750		3/60/440
5	R. Myers	115	DC	115
2	G.E.	6	DC	115
1	Leland	125		3/60/220/440

GAS ENGINE SETS

Qu.	KW	Make	Volts
2	5	Globe	110 DC
4	5		115 DC
2	5	J. Wind	32 DC
2	3	Waukesha	115 DC
1	2.5	B. Stratton	110 DC
1	2	Wisconsin	115 DC
3	1.5	Kohler	115 DC
1	.6	Homelite	110 DC
45	.5	Climax	110 DC
2	.5	Delco	120 DC
5	.5	B. Stratton	150 DC
12	.5	Jacobson	32 DC
60	.4	Champion	12 DC
10	.3	Pioneer	110 DC
1	.25	Pioneer	110 DC
3	.25	Leach	115 DC
40	.25	B. Stratton	115 DC
1	.25	B. Stratton	110 DC

FREQUENCY CHANGER

1—1400 HP General Electric type ATI-24-1250M-300, form C, 3 ph. 60 cy. 460 volt, 300 RPM, 1570 amps, 1250 KVA, 0.9 P.F. 50° synchronous motor with amort. wdg.; dir/conn. to 1000 KW General Electric type ATI-10-1250M-300, 3 ph, 25 cy. 460 volts, 300 RPM 1570 amps 1250. KVA, 0.8 P.F. 50° A.C. generator with amort. wdg., with 33 KW G.E. 125 volt direct connected exciter. (This is a three brg. unit suitable for operation from either end.)

1—10 HP Louis Allis type OH, 3/60/220/440 syn. motor, direct connected to 33 amp 3/180/220, speed 18 RPM.

1—25 HP Allis Chalmers type AN 3/60/220 direct connected to 25 KW 3/240/220 speed 1750 RPM.

1—25 HP GE type 3645, 3/60/220/440 direct connected to 25 KW GE, frame 4052.

SLIPRING MOTORS

3 phase 60 cycle

HP	Make	Type	Volts	Speed
800	Wtg.	CW	6600	507
600	G.E.	IM	2200	1200
600	Al. Ch.	ANY	2200	1180
600	Wtg.	CW	2300	343
500	G.E.	IP	440	450
300	G.E.	IM	2200	514
250	G.E.	IP	440	450
100	Wtg. vert.	CW	2200	1160
100	Ideal	AV	2200/440	720
75	Al. Ch.		440	690
60	G.E.	IM	440	862
50	Al. Ch.	ANY	440	690
50	Wtg.	HF	220	860
50	G.E.	MT	440	1800
50	Al. Ch	ARY	220	690
50	G.E.	MT	220	600
40	Cr. Wh.	20Q	220	1160
40	G.E.	MT	440	860
35	Wtg.	CW	440	1200
30	Wtg.	HF	440	860
25	G.E.	IM	220	1140
25	G.E.	IM	220	855
15	Wtg. C.W.-161C		220	1750

SQUIRREL CAGE MOTORS

HP	Make	Type	Volts	Speed
350	G.E.	KT563	440	1765
150	Wtg.	CS	2200	720
200	Wtg.	CS	440	580
150	Al. Ch.		440	570
150	G.E.	I-K	2250	580
100	Wtg.	CS	2200	870
75	G.E.		440	1725
40	Com. El.	W584	220/440	575
40	G.E.	K505Y	220	585
40	Cr. Wh.		220	1800
40	Cr. Wh.		220	1800
40	Al. Ch.		440	850
35	Al. Ch.		440	480
35	G.E.	IK	440	1200
35	G.E.	KT	220	900
35	Al. Ch.		440	680
35	G.E.	IL	220	900
30	Al. Ch.		440	850
30	G.E.	KT	220	860
30	G.E.	KT	220	660
30	G.E.	KT	220	685
25	A.. Ch.		220	1150
25	Lincoln	IK	220	900
25	G.E.	KT	440	1150
25	Sturtevant	IM11	220	680
20	G.E.	KT	440	870
20	G.E.-	IK	220	1200
20	Fl. Weichsel	15VRN	440	1200
15	U.S.	FR	440	1200
15	L. Allis	OS-326Y	220/440	1740
10	Valley	815A	220	1200
10	W. Elec.	KT	220	865
10	Wagner	RPI 365	220/440	870
10	Howell	SC	440	1200
10	G.E.	KT	440	1165
7½	G.E.	KT	440	1160
7½	L. Allis	OS324	220/440	1160
7½	F.M.	HSZW	220	3600
7½	F.M. vert.	UHI	220/440	3470
5	G.E.	KT	440	1800
5	G.E.	KT	440	1140
5	Lincoln	Fr. 212	440	1200
5	G.E.	KT	440	1200
5	G.E.	KT	440	1720
5	L. Allis	HD	220	1720
5	Wtg.	CS	220	1750
5	N.W.	4C	220	1730
3	Willy	Intm.d.	440	1050
3	C. Wh.	TEFC	220/440	1720
2	G.E.	KT	220	1800
2	G.F. vert.	KT	220	1130
2	G.F. vert.	KT	220	3510
2	L. Allis vert.	K-6	220	850

SYNCHRONOUS MOTORS

HP	Make	Type	Volts	Speed
3000	Al. Ch.	conds	2300	900
2-1000	G.E.	TS	2300	225
900	G.E.	ATI	2300	900
750	G.E.	ATI	2300/4150	220
2-700	G.E.	TS	2200	300
2-300	El. Machy.		440	900
275	G.E.	ATI	440	600
200	Burke	AC-62	2300	600
200	G.E.	TS	208	1200
190	G.E.	Box type	480	600
60	G.E.	K504	440	1200
50	G.E.	K405	220/440	1800

A. C. GENERATORS

KVA	Make	Type	Volts	Speed
225	G.E.	ATI	440	600
200	G.E.	ATB	240	600
175	Wtg.	Ped.brg.	2200	900
100	Wtg.	17-D-400	440	1200
90	W.E.	ATB	480	1200
75	G.E.	ATB	480	1200
75	F.M.	AB	440	900
60	F.M.	D	2300	300
50	Cr. Wh.	ALT	240	1800
35	El.Machy.	8B	240	1200
9.4	Century	Open	120	1200
8	G.E.	ATI	240	900

STEAM ENGINES

375 KVA McIntosh Seymour Cross Compound engine, with Westinghouse Elec. 3 phase 60 cycle 2300 volt generator.

400 KVA Filer-Stowell 15x28x36 cross compound Corliss engine, with Crocker Wheeler 3 phase 60 cycle, 220 or 440 volts AC generator.

500 HP 16x32x36 Vilter Corliss tandem compound condensing engine with a double eccentric. Connected to Allis Chalmers 3 phase 60 cycle 220 volt generator.

676 KVA G.E. A.C. generator, 3 phase, 60 cycle, 480 volt, direct-connected to Ames uniflow horizontal steam engine.

This is a partial listing, only have NEW from ¼ to 75 hp right in stock.

WE ARE ALWAYS IN THE MARKET FOR ALL TYPES OF GOOD MODERN ELECTRIC MOTORS, MOTOR-GENERATOR SETS GENERATORS, TRANSFORMERS, AND OTHER ELECTRICAL EQUIPMENT. SEND US YOUR LISTS FOR BEST CASH OFFERS.

CHICAGO ELECTRIC CO. 1320 W. CERMAK RD. CANAL 2900 CHICAGO 8, ILL.

HOBART 300 AMPERE WELDERS

Model MR 300–S specification 830 A, rated 40 volts, 300 ampere, driven by 20 H. P. 1750 RPM, 22/440/60/3 motor.

LATEST TYPE, IN EXCELLENT CONDITION

Quantity prices on request.

TURBO-GENERATORS—MO TORS—GENERATORS

1—Treadwell Single Drum Mine Hoist, direct driven by 200 HP Westinghouse MCOA, 230 Volt, DC motor

1—20-ton Alfred Box Crane, hand operated, 39 ft. span.

1—20-ton G.E. Locomotive, 500 V DC

1—5000 KW Westinghouse Turbo-Generator, 3600 RPM, 200# press, condensing, 2300/60/3 complete.

1—800 KW Westinghouse M-G set, syn. motor, 1150 HP, 514 RPM, 13200/60/3. Generator 250 V DC with direct connected exciter.

1—50 KW Westinghouse M-G Set, 1200 RPM, 75 HP motor, 2200/60/3. Generator 125 volt DC

1—50 KW Westinghouse Turbo-Generator, 200# press. 75 HP, 7200 RPM, geared to 50 KW, 125 V DC, 1200 RPM

1—700 HP G.E. Type KF motor, 2300/60/3 1800 RPM

1—1000 HP G.E. Slip Ring motor, 6600/60/3, 600 RPM, with controls

1—150 KW G.E. Alternator, Type ATB, Form B, .8 PF, 480/60/3 600 RPM, 3 bearing, direct connected exciter

1—300 KVA Generator set, Burke alternator, 480/60/3, 200 RPM, directed connected to Exciter and Skinner Uniflow, 150#, ISP, O-5# BP

1—3600 sq. ft. Wheeler Surface Condenser.

2—12" Lecourtney Centrifugal, bronze fitted Pumps, 1800 RPM

1—Terry Turbine 710 HP, 3600 RPM, 145# ISP, O-60# BP, 18" x 18" centrifugal pump rated 13,000 GPM, 170' head, 1000 RPM

Heat and Power COMPANY

45 BOND ST. • ALGONQUIN 4-3874 • NEW YORK 12, N. Y.

MOTORS • GENERATORS • TRANSFORMERS

MOTORS
3 phase, 25 cycle, 220/440 Volts

HP	Make	Type	Frame	RPM
1	Gen. Elect.	K	224	1450
1	Westinghouse	CS	224	1425
1	Robbins-Myers	H	Ball Bearing	1425
1	Gen. Elect.	KT	926	1345
1	Louis Allis	ES	Ball Bearing	1430
2	Gen. Elect	KT	731	750
2	Brown & Brockmyer		Enclosed	1450
2	Gen. Elect.	KT	934	1450
2	Gen Elect.	KT	140	1450
2(3)	Reliance	Enclosed	Ball Bearing	750
2(5)	Westinghouse	T.E.F.C.B.B.	284	500
2(3)	Reliance	Ball Bearing	15AA	750
3	Westinghouse	CS	284	750
3	Allis Chalmers			710
3	Gen. Elect.	KT	180	710
3	Westinghouse	CS	354A	715
3	Wagner	LBP		1420
3(5)	Ger. Elect.	KT	944	1500
3(2)	Cr. Wheeler	T.E.F.C.B.B.	284	750
3	Cr. Wheeler	SC		1500
3	Reliance	Ball Bearing		750
5	Gen. Elect.	KT	180	1500
5	Gen. Elect.	K	284	1450
5	Gen. Elect.	KT	181	750
5	Reliance	Ball Bearing	44AA	750
7½	Lincoln	B. B.	D111	1500
7½	Howell	B. B. R.	326	1500
7½	Ger. Elect.	KF		1450
7½(2)	Gen. Elect.	KT	181	1450
7½	Century	ARS		1450
7½	Wagner			750
10(7)	Wagner	19TBM		710
10	Westinghouse	CS		710
10	Reliance			750
10(2)	Gen. Elect.	KT	312	750
10(5)	Gen. Elect.	KT	512	750
10(3)	Westinghouse	Enclosed	Gear Head	1500/378
15	Gen. Elect	KT	327	750
15	Westinghouse	MS		750
15(3)	Westinghouse	CCL		750
15	Westinghouse	CCL		1500
15	Master	Enclosed	Gear Head	1500/416
20	Westinghouse	CS		730
20(3)	Westinghouse	CCL		750
20	Wagner	BP22T		750
25	Gen. Elect.	I	Form K	750
30	Burke			750
30	Gen. Elect.	I	Form K	750
30	Wagner			750
40	Wagner	22TLBP		1500
40	Gen. Elect.	KT	347	750
50	Gen. Elect.	I	Form K	750
75(4)	Gen. Elect.	I	Form K	500
75(2)	Gen. Elect.	KT	557	750
75	Westinghouse	CS		750
100	Westinghouse	CCL		500
150	Gen. Elect.	I	Form K	375
150	Gen. Elect.	KT	568	375
150	Gen. Elect.	KT	557Y (2200 v.)	1470
200	Gen. Elect.	I	Form K	500
225	Elect. Mach.	Synch.	(2200 v.)	500

TRANSFORMERS

3—150 KVA Westinghouse OISC 25/1/2300/460.
3—200 KVA Westingnouse OISC 25/1/2300/460.
3—500 KVA Pittsburgh OISC 25/1/2300/230/460.

MOTORS
3 phase, 60 cycle, 220/440 Volts

HP	Make	Type	RPM	Serial No.
15	Westinghouse	CS	1200	1883285
15	Westinghouse	MS	1200	9445931
20	Westinghouse	CS	1200	2160500
20	Westinghouse	MS	1200	1050826
20	Westinghouse	CS	1800	1863526
20	Westinghouse	CS	1800	2695044
25	Westinghouse	MS	1800	1562026
25	Westinghouse	MS	1800	1334763
25	Westinghouse	CS	1200	2286768
25	Westinghouse	MS	1200	1197673
25	Wagner	BP	1200	126906
30	Westinghouse	MS	1200	1197674
30	Fairbanks-Morse	V-H-10D	1800	43476
40	Westinghouse	CS	900	1896909
40	General Electric	I-K	1800	73318
40	Westinghouse	MS	1800	1506800
40	General Electric	I-K	1200	181444
40	Westinghouse	MS	1200	1027421
50	Westinghouse	MS	1800	1289389
50	Westinghouse	MS	1200	854410
50	Westinghouse	CS	1800	2691183
50	General Electric	14	1800	181444
50	General Electric	KT-352	720	
50	Allis Chalmers		1800	3K28825
60	Reliance		1200	B11458
60	General Electric	I	1800	292596
60	Westinghouse	CCL	1800	329654
60	Robbins-Myers	K	1800	P515362
60	Triumph		1800	C14248
60	Westinghouse	CCL	1200	854121 (2200 v.)
100	Westinghouse	CCL	1800	1043213
100	Westinghouse	CCL	1800	765231 (2200 v.)
125	Westinghouse	CS	1200	2318625
150	Westinghouse	CS	1800	2429726
150	Westinghouse	CCL	900	438385
150	Westinghouse	CS	1200	4572596 (2200 v.)
150	General Electric	I-K	1200	
150	Westinghouse	CCL	720	808349 (2200 v.)
200	General Electric	I-K	900	232917 (2200 v.)
200	Westinghouse	CCL	900	919537 (2200 v.)
250	General Electric	I-K	600	2246834
300	General Electric	I-K	720	2357743
400	General Electric	I-K	900	2347845

SLIP RING MOTORS
3 phase, 60 cycle, 220/440 Volts

HP	Make	Type	RPM	Serial No.
20	Westinghouse	CW644C	675	8009992
20	General Electric	MT332	545	3889010
30	Westinghouse	HF	1745	4558408
40	Westinghouse	CW748	690	4406823
250	Allis Chalmers	3 bearing	505	104390 (2300 v.)
400	General Electric	I-M	900	224674
400	General Electric	I-M	900	246762

MAGNETIC CONTACTOR

400 HP. Gen. Elec. Type CR 7006. Form D13D. 3/60/440 Volts.

25 CYCLE GEARHEAD MOTORS

3—10 HP. Westinghouse Frame. 364. Enclosed 1500/378 RPM.
15 HP. Master Frame 405 Enclosed 1400/416 RPM.

SPECIAL

5—5 HP. Westinghouse Motors Nema Frame CSW 284—Totally Enc., Fan Cooled Ball Bearing 3/60/220/440 volts, 1200 RPM.
1—40 HP Reliance Variable Speed 230 v. DC. Dripproof Ball Bearing 400/1500 RPM.

CAPACITORS

3—30 KVA Gen. Elect. Pyranol Filled Capacitors 3/60/2300 v.
3—60 KVA Gen. Elect. Pyranol Filled Capacitors 3/60/2300 v.

ERIE ELECTRIC CO., INC. 124 CHURCH ST. BUFFALO, N. Y. CL. 4758

REBUILT POWER EQUIPMENT READY TO SHIP!

SLIPRING MOTORS—3 PH., 60 Cy.

H.P.	Make	Volts	R.P.M.	Type
400	Westg.	2200	435	CW
260	Burke	440	600	EMY-65
200	G.E.	220/440	1200	M-1
150	G.E.	220/440	1200	M-1
50/60	Westg.	220	1800	CW
30	Westg.	220	1160	CW
20	Westg.	220	575	CW
1	Duquesne	220/440	1200	

ALTERNATING CURRENT MOTORS
3 ph. 60 cy.

H.P.	Make	Volts	R.P.M.	Type
225	Westg.	220/440	1200	C
200	Westg.	220/440	1200	C
150	Westg.	220/440	900	C
150	Wagner	440	1800	31V
100	Triumph	220/440	850	B-15
100	G.E.	220	1745	I
75	West.	220/440	1800	MS
75	Triumph	220/440	685	B-15
60	West.	220/440	1800	CS
50/32	G.E.	440	800/640	
50	Chandeys'n	220/440	1800	
50	Westg.	440	1200	CS
40	Westg.	440	870	CS
40	Westg.	440	1170	CS
40	Westg.	220/440	1800	CS
35	Westg.	220/440	1200	C
30	Westg.	440	900	CS
30	Westg.	220/440	680	CS
30	Westg.	220	450	CS
25	Westg.	220/440	575	CS

VARIABLE SPEED MOTORS—
230 VOLT D. C.

H.P.	Make	R.P.M.	Type
100	West.	300/900	SK-191
100	Westg.	175/300/700	SK
25	Westg.	600/1200	SK
20	Westg.	500/1500	SA
20	West.	750/1500	SK-110L
20	West.	625/1250	SA-6
15	Reliance	500/1800	
15	Westg.	875/1600	SA
15	Westg.	825/1650	SK
13	Westg.	500/1000	S-7
10	G.E.	625/1250	LC
10	Westg.	565/1130	S-6
10	Westg.	400/1600	SA
7½	Westg.	450/1800	SK
7	Westg.	660/1050	S
5	West.	400/800	SK-80
4	G.E.	850/1700	LC-8
3	G.E.	400/1200	RLC-114
3	Roth	500/1000	RS

SERIES WOUND MOTORS

H.P.	Make	Volts	R.P.M.	Type
175	G.E.	230	475	MD
140	G.E.	230	410	MD
80	G.E.	230	500	MD-107
80	West.	230	490	76-A
50	G.E.	230	550	MD-106
50	Cr. Wh.	230	500	SM
35	Westg.	230	550	49D
32	G.E.	230	450	801
32	Shaw	230	485	5L2E
28	Westg.	230	395	904
25	West.	230	600	MT
15	West.	220	650	
15	Cr. Wh.	220	270	SM
10	Westg.	230	750	MT-00
7½	Westg.	230	725	L
7.5	Westg.	230	1100	MC

230 VOLT DC MOTORS

H.P.	Make	R.P.M.	Type
100	West.	300	SK
85	West.	500	M
80	G.E.	500	MD107
75	Westg.	225	
30	Reliance	1700	
30	G.E.	1100	ELC
25	Westg.	600	SK
20	Western Elec.	1000	E-40-M

TRANSFORMERS
1 ph. 60 Cy.

Qu.	KVA	Pri. Volts	Sec. Volts	Make
1	½	110	6 12.18	Packard
1	2	1040/2080	52/104	G.E.
1	2½	2200/1100	220/110	Al. Chal.
1	5	1040/2080	115/230	G.E.
1	5	1100/2200	122/244	G.E.
2	7½	2200/1100	440/220/110	Westg.
1	10	2300/1150	220/110	Westg.
2	15	2200	220/110	Cr. Wh.
11	18	220	19½/38½	Elec.Fur.
1	20	2300	110/230	Westg.
1	20	1150/2300	115/230	Maloney
1	24	220/110		
2	25	440/220/110		Elec.Fur.
3	30	318/254		Pgh.
2	35	440/220/110		Elec.Fur.
9	37½	2400	480/240	G.E.
1	40	1100/2200	110/220	Pgh.
3	40	2100/1050	210/105	Westg.
4	75	2400	240/480	G.E.
3	112.5	2400	240/480	G.E.
3	150	2300	220/440	Duncan
1	150	2200/2300/2400	220/110	G.E.

D.C. CLARK CONTROLLER

1—250 HP Clark Vari Time magneto controller 230 v. DC reversing, used for plugging service. Can also be used non-reversing.

MOTOR GENERATOR SETS—
250 & 500 V. D.C.

1—80 KW 720 rpm. 250 v. G.E. Generator V-belt driven by 150 HP 1800 rpm. 220 or 440 v. 3/60 Westg. Motor.
1—85 KW 680 rpm. 250 v. Westg. Generator dir. con. to 220/440 v. 3/60 motor.
1—75 KW 250 v. West. Gen. dir. con. 440 v. 3 ph. 60 cy. AC Motors.
1—50 KW 250 v. DC Gen. dir. con. 220/440 v. 3 ph 60 cy. AC Motor.
1—30 KW 250 v. DC generator direct driven by 46.5 HP 1750 rpm. 220/440 v. 3/60 Westg. Motor.
1—30 KW 250 v. DC 1150 rpm. Reliance Generator dir. driven by 50 HP 220 or 440 v. 3/60 motor.
2—20 KW 1700 rpm. 250 v. Westg. SK Gens. dir. driven by 30 HP 220 or 440 v. 3/60 cy. motors.

INDUSTRIAL TRUCKS

9—Automatic type LO-5 Low Lift Trucks capacity 5 ton, platform type. Equipped with towing coupler and bumper for pushing cars.
10—New 4 ton Yale & Towne model YSW Multi-Stroke Hand Lift Platform Trucks.

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D.C. GENERATORS, ALL VOLTAGES
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ALL SIZES
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3 ph. 25 cy. Motors
125 Volts D.C. Motors
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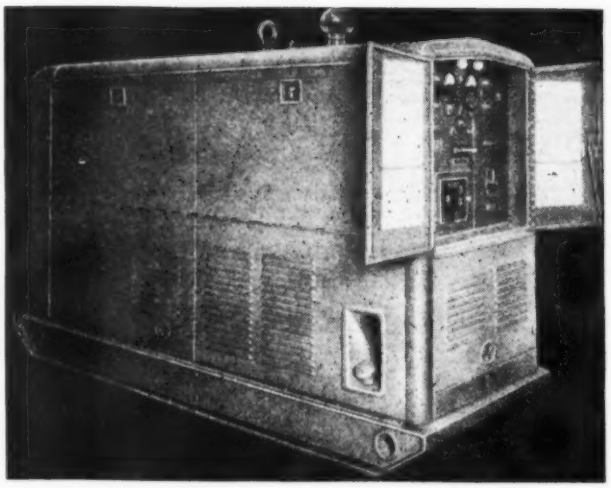

15 KW 30 KW 50 KW
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RADIATOR COOLED—SKID MOUNTED

60 cycle 127/220 volts
50 cycle 230/400 volts

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650 H.P. Integral Furnace Boiler 400# Code, like new.
1—750 KW Allis Chalmers Turbine with Jet Condenser, 150#.
1—200 KW 2300 volt, G.E. non-condensing Turbine, 150#—5# B.P.
1—450 H.P. Allis Chalmers Synchronous Motor, 3 bearing, 3 phase, 60 cycle, 440 volts, 300 RPM with Starting Panel.

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250 KW Busch Sulzer 240 V.
250 H.P. Busch Sulzer 257 rpm. Engine.
192 KW McIntosh Seymour 2300 V.
100 KW Busch Sulzer 2300 V.
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80 H.P. F.M. 300 rpm. Diesel Engine.
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FOR IMMEDIATE DELIVERY

PRICED FOR QUICK SALE

TURBO-GENERATORS

3—300 KW G.E. AC Generators 3/60/450 1200 RPM type ATI Form EL con. thru red. ratio 4:1 with G.E. Turbines type DORV 325 N Steam 400# RPM rated 4873 with G.E. Exciters 120V 40KW

8—200 KW G.E. AC Generators 3/60/450 1200 RPM 851 AMP PF75 Form BL Type ATB 6-1200 conn. thru red. gear with G.E. Turbines, Type DN 55, Steam 375# with G.E. Exciters 120 V Type EF1

12—150 KW Whse—DC Generators Type SK 120V 1200 RPM 1250 AMP conn. thru red. gear with Moore Turbines form V3 S3 Steam 225, ex 25 Vac, Bleed PR 10#

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11—Ideal Electric Ball bearing 25 KW Alternators 3/60/450 direct conn. to 40 HP - DC Motors Type D 115V 1800 RPM 290 AMP

10—Star Electric, with Motor Regulators 25 KW AC 1/60/120 (some 3/60/120 direct connected to 40 HP DC Motors, 1200 RPM Type GN 6502 with DC exciters 120 V, 45V, 2KW

3—60 KW G.E. DC Generators 1765 RPM Type COM 1347 Y Form AA 110V full ld. direct conn to 85 HP AC motors 3/60/440 type K 50° temp. rise thru V - Belt with G.E. exciters 125V

1—Allis Chalmers unit consisting of 1 AC Motor 30 HP type ARW 3/60/440 24 hrs. 37.8 Amps coupled on each end to 2 8½ KW DC Generators 1740 RPM S. wound type EB1—8C 120V with DC exciter 2 KW, CW, 120V

AIR COMPRESSORS

2—Ingersoll Rand Type 30, 5 and 5 and 4 by 4 Comp. driven by GE type KG 15 HP AC 3/60/440 motors

4—Platt Iron Works, vertical 20 cu ft an hour at 3000# press at normal temperature in 4 stages 350 RPM 45 HP steam 100 lbs.

MOTORS

2—Whse 1500 HP DC 600 RPM 525 V 2270 Amp. shunt wound

500 DC motors, 120 V, from ½ HP to 60 HP. Various makes and speeds.

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200 HP Worthington Full Diesel 4-cyl., 357 RPM, Type No. ATB.

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PRICE REDUCED FOR QUICK SALE

250# PRESSURE Wickes 607 H P 300% RATING water tube boiler. GUARANTEED TO PRODUCE 50,000 POUNDS OF STEAM FOR 2 HOUR PERIODS. Riley super stoker 300% rating—Combustion Engineering Co. Elesco, superheaters, induced and force draft fans motor driven with controls—5 Vulcan soot blowers—All valves on boiler. All trim such as pressure guages, water columns etc. Steel structural supports—Copes feed water regulator and other items—Will sell this boiler with or without stoker or fans

PURCHASED AS A SPARE IN 1930 USED ABOUT 3 YEARS, LAST INSPECTION REPORT (MARCH 1945) ALLOWS 250 LBS. PRESSURE, HAS NOT BEEN USED SINCE.

Boiler and accessories have been taken out and are now stored in New York City

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One 250 K.V.A. and one 300 K.V.A. Crocker Wheeler Generators direct connected to Skinner Tandem compound engines—480 Volts—3 phase 60 cycle, switchboard, instruments, piping.

One 300 K.W. General Electric Generator, 2300 v., 3 ph., 60 cy., direct connected to Curtis Steam Turbine, 175 lbs. pres.—3600 R.P.M. with 15 K.W. G.E. direct connected exciter.

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Induction Type—220 V.—2 Ph.—60 Cy.

1—5 H.P. Burke—Type EB 5—1130 R.P.M.
1—5 H.P. Burke—Type EB 75—900 R.P.M.
1—7½ H.P. R&M—TYPE K—850 R.P.M.
1—10 H.P. Burke—Type EM 1.2—900 R.P.M.
2—20 H.P. Burke—Type EM 3—1200 R.P.M.
1—20 H.P. Crocker Wheeler—1170 R.P.M.
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1—7½ H.P. totally enclosed—fan cooled—1200 R.P.M.

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1—Vertical Centrifugal Pump, 3" suction, 3" discharge, all iron, 25 g.p.m.—52' head, complete with 5 H.P. Louis Allis Vertical Explosion Proof Motor, 220-440 volts, 3 phase, 60 cycle, 1750 r.p.m.

One American Well 2 stage Centrifugal pump direct connected to 30 H.P. G.E. motor, 220 v., 3 ph., 60 cy., 1750 R.P.M. 200 ft. head complete with magnetic starter and safety switch.

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2—American Well Works; capacities 85, 165 and 200 g.p.m. with 10 & 15 H.P. Motors; Current 220 volts, 3 phase, 60 cycle.

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One 444 H.P. Union Iron Works, water tube steam boiler 200 lb. working pressure, pulverized coal or oil fired.

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40 H.P. Nagle vertical steam engine, Class F. 12" cylinder, 12" stroke, flywheel 54" x 12½".

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1500 CFM 2 STAGE AIR COMP. 275 HP. 60 CY. 2200 V. Syn. Motor Dr.
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1—1250 KW General Electric Turbo-Generator, Type ATB, Form HT, 3600 RPM, direct-connected exciter, Wheeler Jet Condenser.
1—2000 KW General Electric Turbo-Generator, 180 lb. pressure, 3600 RPM Generator, Type ATB, 600 Volt AC. 2403 Amp. with Westinghouse-LeBlanc Jet Condenser.
1—1500 KW Westinghouse Turbo Generator with Surface Condenser 4200 sq. ft.

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3—400 HP Casey Hedges Water Tube Boilers.
1—500 HP Casey Hedges Water Tube Boiler. Foster Superheater. These boilers are oil fired, system complete, automatic draft control equipment, etc.

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450 & 600 lb. Modern Boilers & Accessories
450 & 600 lb. Turbo-Generators. Non-Cond.
450 & 600 lb. Turb.-Gens. Cond., Bleed Type

2—770 HP B&W Co. Stirling 200≠ Boilers
1—612 HP B&W Co. Stirling 200≠ Boilers
3—1400 HP B&W Co. Cross Drum 225≠ Boilers.
Various Makes, Boilers 150 to 2000 HP.
Turbo-Generators 100 KW to 12500 KW.

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STEAM PUMPING ENGINES

1—**Snow** 8MGD C&FW cr. Com. Opp. Type Cond. 26x54x17x36, with waterworks type condenser.
1—**Snow** 6 mgd. C&FW Cr. Com. Opp. Type Cond. 20x40x14¾x36 with waterworks type con.
1—**Allis-Chal.** 4 mgd. cr. com. cond. Size 12x28x13x24. All find cond.
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Birch Valves for all types of reciprocating pumps.

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1500 H.P.—1250 KVA

Nelseco — General Electric
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3/60/2400, 300 RPM, All Accessories, Complete
Immediate Stock Delivery Rebuilt

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1—84"x20' 160≠ ASME HRT Boiler
1—155 HP Heine ASME W. T. Boiler
1—312 KVA Gen. D/C Full Diesel Eng.
1—40,000 Gal. Water Tank & Tower
2—83 HP, 150≠ Loco Type Boilers
1—187 KVA Gen. D/C 4-Val. N.R.C. Eng.
2—500 HP B&W 200≠ ASME Code WT Boilers

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SLIP RING MOTORS
3-PH., 60 CY.

HP	Volts	Make	Speed
900	2300	G.E.	900
500	2300	G.E.	900
400	2300 440	Whse.	400
400	2300 440	G.E.	600
350	2300 440	G.E.	600
300	440	Al. Chal.	900
300	2200/440	G.E.	600
300	2200	G.E.	1800
250	2300	G.E.	600
250	440/550	G.E.	600
200	2200/440	G.E.	600
150	2200	G.E.	450
150	2200/440	G.E.	600
125	440/220	G.E.	1200
125	440/220	G.E. (Hoist)	900
100	220/440	G.E.	720
100	440/220	G.E. MTC	900
100	550	G.E.	900
100	2200	G.E.	900
100	2200	G.E.	1800
75	2200	Al. Chal (new)	900
75	440 220	G.E. (MTC)	600
75	2200/440	G.E.	1200
50	2200/440	G.E.	600
75	550	G.E.	900
60	2200	G.E.	900
40	2200	Whse.	900
40	2200	G.E.	1200

SYNCHRONOUS MOTORS
3-PH., 60 CY.

300	440/220	Al. Ch.	600
200	2200	Whse.	900
110	440	Whse.	900
100	2200/550	Al. Ch.	1800
100	440/220	G.E.	360
75	440 220	G.E.	720

OUTDOOR OIL CIRCUIT BREAKERS

1—New 400 Amp. Type FK, 136-1328A, General Elec. 3PST, 25,000 Volt Oil Switch, Interrupting Capacity 125,000 KVA, complete CT's PT's, etc.
1—NEW 400 amp., Type FKO 227, G. E., 7500 V., outdoor type, hand-operated.
1—3000 ampere, type FK 25, General Electric, 3 pst, 600 volt.

TRANSFORMERS
60 CYCLE

4—1250 kva, Al. Chal., 13800-460/230 V.
3— 833 kva. Whse., 11000-2300 V.
3— 500 kva, G.E., type H, form KS, 13800-230/460.
3— 333 kva., G.E., 66000-480 V.
1— 300 kva., Whse., 3 Ph., 13800-230 V.
3— 250 kva., Whse., 13,800-460.
1— 200 kva., Whse., 11000Y-2300 V.
3— 200 kva., G.E., 13200-480 V.
6— 200 kva., G.E., NEW PYRANOL, 2300-450 V
3— 150 kva., G.E., type HTQ, 4150-240/480 V.
3— 150 kva., G.E., H-KDD 13200-2300.
3— 150 kva., G.E., H-KS, 2400-240/120 V.
3— 100 kva., G.E., type H 2400-240-480.
3— 100 kva., G.E., type H-KDD, 6900/11950V-230/115.
3— 100 kva., G.E., type H-KR 6600/11430V-2300 V.
3— 100 kva., G.E., H-KDD, 6600/11950-230/115 V.
3— 100 kva., G.E., H-KS, 2400-240/480 V

TURBO-GENERATOR SET

1—112½ kva., 1200 rpm., 220/440 v., 3 ph., 60 cy., G.E., conn. to Terry, 3600 rpm., non-cond. turbine, 100/150 lbs. gu.

SQUIRREL CAGE MOTORS

HP	Volts	Make	Type	Speed
500	440/220	G	IK	1200
500	440/220	G.E.	IK	900
400	2200/440	Whse.	CS	720
300	440	Whse.	CS	450
250	2200/440	G.E.	IK	600
250	2200	G.E.	IK	450
200	440/220	G.E.	IK	1200
150	440/220	G.E.	KT	720
150(3)	440/220	G.E.	KT	1200
125	440	G.E.	K	514
125	440/220	G.E.	KT	1800
125	440/220	G.E.	KT (Vert.)	1800
100	440	G.E.	IK	450
100	2200	G.E.	KT	1800
100	440	Whse.	CS	1200
100	550	Cr. Wh.		720
100	550	G.E.	KT	900
74	2200	G.E.	KT	900
50	2200	Al. Chal.		720

MOTOR GENERATOR SETS

1—75 KW, 250 V, 850 RPM, conn. to 110 HP, 440/220 V. Sq. Cage Motor.
1—50 KW, 250 V. 850 RPM, Whse. conn. to 75 HP. 440/220 V. 3 ph. 60 cy. Sq. Cage Motor.
1—50 KW, 125 V., 1200 RPM, Whse. conn. to 75 H.P. 2200/220 V.; 3 ph., 60 cy., Sq. Cage Motor
1—35 KW, 125 V., 1800 RPM., G.E., conn. to 50 HP., 440/220 V., 60 cy., squirrel cage.

A.C. GENERATORS

1—375 kva, 514 rpm,480/240 V, G.E.
1—250 kva, 600 rpm, 440/220 V. Al. Ch.
1—200 KVA, 600 RPM, 4150/2300 V., Cr. Wh.
1— 96 kva, 360 rpm. 480/240 V. G.E

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TURBO GENERATORS; 20,000 KW. 12,000 KW. with or without BOILERS

GENERATORS; 2000 KW.—600 RPM. 700 KW-300 RPM.

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Various Sizes

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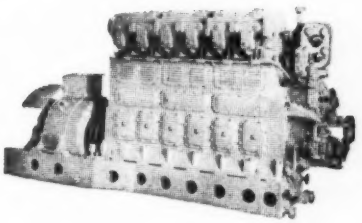

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1560 KVA Wghse 480 v. (bleeder)
1556 KVA Al. Chal. 2300 v. Cond.
1556 KVA Al. Chal. 480 V. non-cond.
1250 KVA Al. Chal. 480 V. non-cond.
1250 KVA G.E. 2300 v. (bleeder)
750 KVA G.E. 2300 v. Cond.
625 KVA Wghse. 480 v. (bleeder)
625 KVA G.E. 2300 v. Cond.
625 KVA Elliott 480 V. non-cond.
312 KVA Elliott 480 V. cond.
110 KVA Al. Chal.-Kerr non-cond.

MOTOR GENERATOR SET

150 KW G.E. 250 volt—225 HP G.E. 3-60-440 V. synchronous motor.

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1000 KVA G.E.—Skinner Uniflow
625 KVA G.E.—Skinner Uniflow
350 KVA G.E.-Ames
187 KVA (2) G.E.—Chuse 4 valve
166 KVA Al. Chal.-Ames

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1000 HP Sterling 200#
750 HP. (2) Sterling 250#
500 HP Sterling, 200#
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300 HP (2) Heine Marine type 250#

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125 KVA W.E.-Worthington

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ALTERNATORS ALL FREQUENCIES
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1—1200 A. GE FK 132 A 3 PST 7500 Handle with Trip Coils and Current Transformer.
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1—3000 A GE FK 25 Oil Breaker 3 PST 600 V. Solenoid operated with currents.

Sq. Cage—220/440 V. 60 Cy. 3 ph.

Qu.	HP	Make	Type	Speed
2	50	G.E.	KT-327	1800
2	100	G.E.	IK	1800
1	150	West.	CS	1800

Slip Ring—220/440 V. 60 cy. 3 ph.

1	40	West.	CW	720
1	50	G.E.	I-M	900
1	60	G.E.	I-M	900
1	75	West.	CW	900
1	250	West.	CW	1200

D. C. Variable Speed 230 V.

1	15	West.	SK	400/1600
1	25	West.	SK	440/1200
1	50	West.	SK	500/1500
1	50	G.E.	CD	400/1600

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25 HP to 2100 HP Boilers—All types
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150 ton Ice Machine, Uniflow drive
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80, 60, 25, 15 HP DC 115V. motors
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120 HP Fairbanks Morse Diesel engine.
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1—1392 HP Springfield sectional Header 400#.

2—617 HP Wickes 3 Drum, low head, 250# pressure, with forced draft chain grate stokers.

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2—5000 KW Westinghouse 3600 RPM 3/60/2300 volts Condenser, all auxiliaries.

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1—350 KW Burch Sulzer 3-60-2300 Volt, all auxiliaries.

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1260 KVA Nelesco engine generator.

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1—150 KW Skinner Uniflow Engine Generator Set A.C.

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1—500 KW Non Releasing Corliss, 3-60-240 volts.

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90,000# Cochran deaerating feed water heater.

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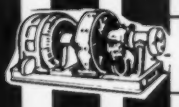

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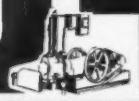

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ESTABLISHED 1904

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Automatic Extraction Turbo Generator, General Electric, 935 KVA, for 28 inch vacuum 5# extraction pressure.

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Left hand, non-condensing, full Poppet valve engine: General Electric 3 60 440, Generator: Belted 30 KW exciter. Complete and in Perfect Condition.

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FOR SALE

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Two 4-drum boilers, 1,001 h.p. each. 250 pounds w.p. Drums, Structural steel and trim. All good condition. We'll furnish new tubes. Available at once.

One 4-drum boiler, 500 h.p. 200 pounds w.p. Ten years old with stoker. All in fine condition. Available at once.

Michigan Boiler & Engineering Co.
4120 W. Jefferson, Detroit 9, Mich.
Phone Lafayette 5680

5—Late style 1500 Watt, 110 volt, DC Kohler Plants, perfect shape, $225.00 each.

1—Generator, Electric Machinery, Ser. 84186, International 4 cyl. gas engine, Mod. U-9, Ser. UCB3490, Motor Ser. UCBM1082, 112/208 volts, 3 phase, 60 cycle, 30 KVA with Exciter. Completely rebuilt $1500.00.

1—Generator, American, Mod. 1504-4, Type OG, Ser. 15046, Buda, 6 cyl. Diesel, Mod. 6DT389, Ser. 8885, 120/208 volts, 3 phase, 60 cycle, 1200 RPM, 35.5 KVA. Completely rebuilt $2500.00.

1—Light Plant, Electric Machinery, Ser. 84190, International 4 cyl. gas engine UCV3887, 3 phase, 60 cycle, 125/208 volts, 30 KVA. Completely rebuilt $1500.00.

1—Generator Set, Electric Machinery, Ser. 2127 Hercules 6 cyl. gas Mod. WXLC3, 3 phase, 60 cycle, 125 volts, 35 KVA with Exciter and spare parts. Completely rebuilt $2500.00.

1—100 KW Steam Engine Generator AC 240 volts, 60 cycle, complete with switchboard—$3500.00.

PORTER ELECTRIC COMPANY, INC.
330 S. 6th St. Minneapolis, 15, Minn.
GEneva 8655
ELECTRICAL EQUIPMENT COAST TO COAST

OVERHEAD CRANES

1-Ton
Whiting 33' Span
Curtis 24' Span
1½-Ton
Shepard Niles 25'6" Span
P&H 34' Span
2-Ton
Louden 19'2" Span
Box 36'9" Span
Detroit 28' Span
3-Ton
Shaw 33' Span
P&H 25' Span
Northern 22' Span
Manning, Maxwell & Moore 48'¾"
"Conco" 48' and 26'6" Spans
5-Ton
Whiting 47'4" Span
38'10½" Span D. C.
Northern 30'9" Span
Milwaukee 70' Span
Milwaukee 66'9" Span
Manning, Maxwell, & Moore 70' Span
Manning, Maxwell, & Moore 47'4" Span
Shaw 36' Span
Champion 37'6" Span
American 70' Span
American 47'4" Span
6-Ton
P&H 77' Span
American 77' Span
7½-Ton
Shepard 36' Span
10-Ton
Shaw 68' Span
Shaw 73' Span
P&H 30' Span
P&H 87'6" Span
P&H 80' Span
Northern 71'10½" Span
Northern 60' Span
Morgan 55'6" Span
Morgan 39'5" Span
Morgan 52'3" Span
Milwaukee 66'9" Span
McGill 85' Span
Lane 50' Span
Ensco 75' Span
Dominion 35' Span
Cleveland 38'½" Span
Cleveland 50' Span
Alliance 71'10½" Span
Alliance 58'9" Span
Albany 60' Span
15-Ton
Whiting 71'10½" Span
Northern 53' Span
Erie 60' Span
Chesapeake 55'6" Span
Case 51' Span
20-Ton
Shepard Niles 49'6" Span
P&H 51'4" Span
Northern 60' Span
Morgan 60' Span
Cleveland 65' Span
25-Ton
Whiting 106' Span
Tysaman 60' Span
P&H 70' Span
Morgan 52'3" Span
Cleveland 106' Span
Case 63' Span
Bedford 50' Span
30-Ton
Whiting 80' Span
P&H 80' Span
P&H 60' Span
Morgan 30' Span
Case 41' Span
35-Ton
Bedford 50' Span
Northern 22' Span
50-Ton
Shaw 95' Span
Shaw 69'10" Span
Dominion 80' Span
Cleveland 71'10½" Span
75-Ton
Morgan 59'2½" Span
Alliance 78' Span
Alliance 37' Span
80-Ton American 40'6" Span
125-Ton Morgan 100' Span
150-Ton Whiting 30' Span
175-Ton Morgan 54' Span
200-Ton Alliance 100' Span

Telephone us collect to discuss your requirements.

ECONOMY CO., Inc.
49 Vanderbilt Avenue, New York 17, N. Y.
Telephones: MUrrayhiH 4-2294, 4-2893, 4-2295, 4-2844, 4-2296, 4-3292

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TENNESSEE VALLEY AUTHORITY
DEPARTMENT OF PROPERTY AND SUPPLY

SURPLUS PARTS FOR RILEY STOKERS
FOR IMMEDIATE SALE AND DELIVERY
$15,000.00 VALUE

FOR RILEY NO. 5 ATRITA PULVERIZER AND RILEY STANDARD UNDERFED STOKER

ALSO APPROXIMATE $15,000.00 VALUE OF HIGH PRESSURE VALVES AND FITTINGS

FOR INFORMATION AND PARTS LIST WRITE OR WIRE

SALES AND TRANSFER SECTION
OLD POST OFFICE BUILDING, KNOXVILLE TENNESSEE
TELEPHONE 2-7181—EXTENSION 873

1—Westinghouse Alternating Current Generator, 250 K W., 220 volts, 568 amps per terminal, 3 phase, 60 cycles, 257 R.P.Ms.

1—Pettibone Coal Pulverizer, manufactured by the Simms Company, Erie, Pennsylvania.

Pettibone Unit, size G2, capacity one ton per hour, driven by 30 h/p induction motor, 230 volts, 71.5 amps per terminal, 60 cycles, 3 phase, 750 R.P.Ms.

1—Dongo Magnetic Separator, 110 volts, high intensity, type 12SM, all required electrical control, manufactured by the Dongo Magnetic Seperator Company, Milwaukee, Wisconsin.

1—Williams Patent Crusher, manufactured by the Williams Patent Crusher & Pulverizing Company, St. Louis, Missouri. Powered with a 7.5 h/p motor, 3 phase, 223-240 volts, 60 cycles, type CS, class 1, frame 284, with all required electrical controls.

1—G.E. Induction Motor. Type KT-326-6-30-1200, form B, model 97, volts 220, amps 73, phase 3, cycles 60, h/p 30, R.P.M. 1150, full load #4154403.

1—General Electric Co. Starting Compensator, N.R. 5025-R.I.-3233 volts, Pri. 220, Sec. 88-187, for 30 h/p motor, 60 cycles, 3 phase.

1—General Electric Co. Starting Compensator N.R. 5006, R.I. 3233 volts, Pri. 220, Sec. 110-176, for 7½ h/p motor, 60 cycles, 3 phase.

GENERAL INSTITUTE OF CHILD HYGIENE
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FOR SALE

1—Used Chapman 36 in. gate valve with hub, electric motor operated

1—Used Crane Steel 8 in. H.P. valve

CHARLES GREENBLATT
248 So. William St.
Newburgh, New York

FOR SALE

1 Chuse Engine, #1003, 11 x 12 Piston and Stroke, 277 R P M, 4 Valves—

which is directly connected to

1 Westinghouse Alternator AC #1205098 2 Phase, 75 KVA, 200 V, 170 Amp, 60 Cycle—277 R P M

and

1 Westinghouse Exciter DC #1205053 Type SK #130, 7 KW, 125 V, 56 Amp. 277 R P M

also

A one section slate panel switch board size 36 x 66".

FAITH MILLS, INC.
Averill Park, N. Y.

FOR SALE

DIESEL ENGINE

1—Vertical Diesel Engine Type D4 300 HP 4 Cylinder, direct connected to General Electric Type LDR-8 direct current Generator 200 KW 327 RPM L 250 V.

EXHAUST TEMPERATURE INDICATOR

1—Alnor Exhaust Temperature Indicator with 4-point switch and 4 couples Mfd. by Worthington Pump and Machinery Corp. Mfrs. No. V0862. Installed 1933. In Excellent condition and is in operation now.

The Frank Tea & Spice Company
Cincinnati 2, Ohio

1—Westinghouse Voltage Regulator Transformer 69 KVA Serial No. 2623894

1—Ditto Serial No. 2623895

1—Westinghouse Double Flow Turbo-Generator 2500 KVA

1—Terry Turbo-Generator 625 KVA

1—General Electric 500 K.W. Generator

FS-139, Power
330 West 42nd St., New York 18, N. Y.

FOR SALE

NORDBERG UNAFLOW ENGINE

manufactured 1933, perfect condition, 600 HP condensing, 550 HP non-condensing. Can be connected to line shaft or direct connected to generator. Available for immediate delivery.

DAVIDSON RUBBER COMPANY
50 Brighton Street
Charlestown 29, Massachusetts

FOR SALE

STEAM ENGINE

500 H.P. Vilter Corless Tandem Compound Condensing Steam Engine, 1909, and 560 amp. 440-volt, 3-phase, 60-cycle, A. C. Allis-Chalmers Generator.

Pfister & Vogel Tanning Co.
1531 N. Water St., Milwaukee 1, Wis.
P. O. Box 745 Telephone: Daly 1895

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125 H.P. RICKARDS Corliss Steam Engine. 18" steam cylinder; 32" stroke. 12' drive wheel, 28" wide. 10" drive shaft. Single Eccentric, Rooksby off type Croliss valve gear. New valves & stems. Ball Governor. 6" Ball steam valve. Automatic feed & hand-feed lubricator. Dash pots & bearings perfect. Engine in perfect condition; See in operation. 22"x78' double belt 2 yrs. old like new. Has oil cups, governor belt & automatic feed on crosshead. Running 85 RPM can go faster.

WALLACE TDG., 400 N. 3rd, Phila.

FOR SALE

1—New steel stack,

57" diameter x 100' high with breeching, double setting with 12' centers. Will send print.

THE ACME FOUNDRY & MACHINE COMPANY
Coffeyville, Kansas

FIRE . . .

plays no favorites

Fire attacks a furnace lining in its weakest spot. It searches out the weakness of any refractory without respect for types or brands. In laid-up fire brick linings, the fire finds their weakness in the joints.

By eliminating the joints, Plibrico Jointless Firebrick presents an unbroken surface of uniformly high-quality refractory to the onslaught of the fire. As a result, it far outlasts ordinary furnace linings.

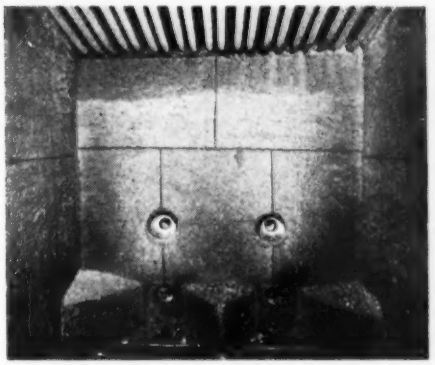
This basic advantage of Plibrico—its solid, monolithic construction—is the only reason you need for preferring it to all other refractory linings. But you have many more reasons: Its method of installation in moist, plastic form permits the construction of arches and openings in any shape or contour, eliminating special tile shapes. The method of tying Plibrico to exterior walls with patented Flexco-Anchors prevents bulging. The fact that Plibrico walls can be readily air cooled to meet extreme service conditions.

Plibrico is the ideal refractory for any furnace work from a small repair to a complete lining. And behind Plibrico products is an engineering staff that knows furnace design. Your Local Plibrico Sales & Service engineer will be glad to quote on your requirements including complete installation service if desired. Write for large catalog, specifying H.R.T. or water tube edition.

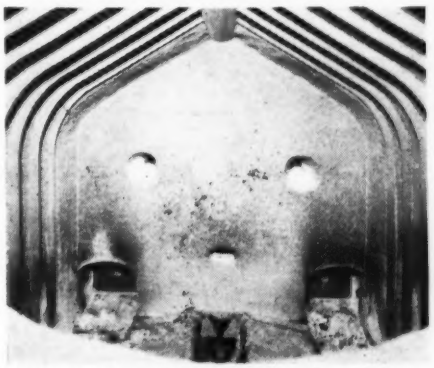
PLIBRICO JOINTLESS FIREBRICK COMPANY
1818 Kingsbury Street (Dept. F), Chicago 14, Illinois

PLIBRICO
Jointless FIREBRICK

FOR H.R.T. BOILERS. Forms front door arches, bridge walls, rear walls. Fits snugly around boiler shell.



FOR WATER TUBE BOILERS. Forms door openings, suspended arches, burner ports. Widely used for air-cooled walls.



FOR SPECIAL FURNACES. Suitable for all types of special furnace construction, backing water walls, etc.

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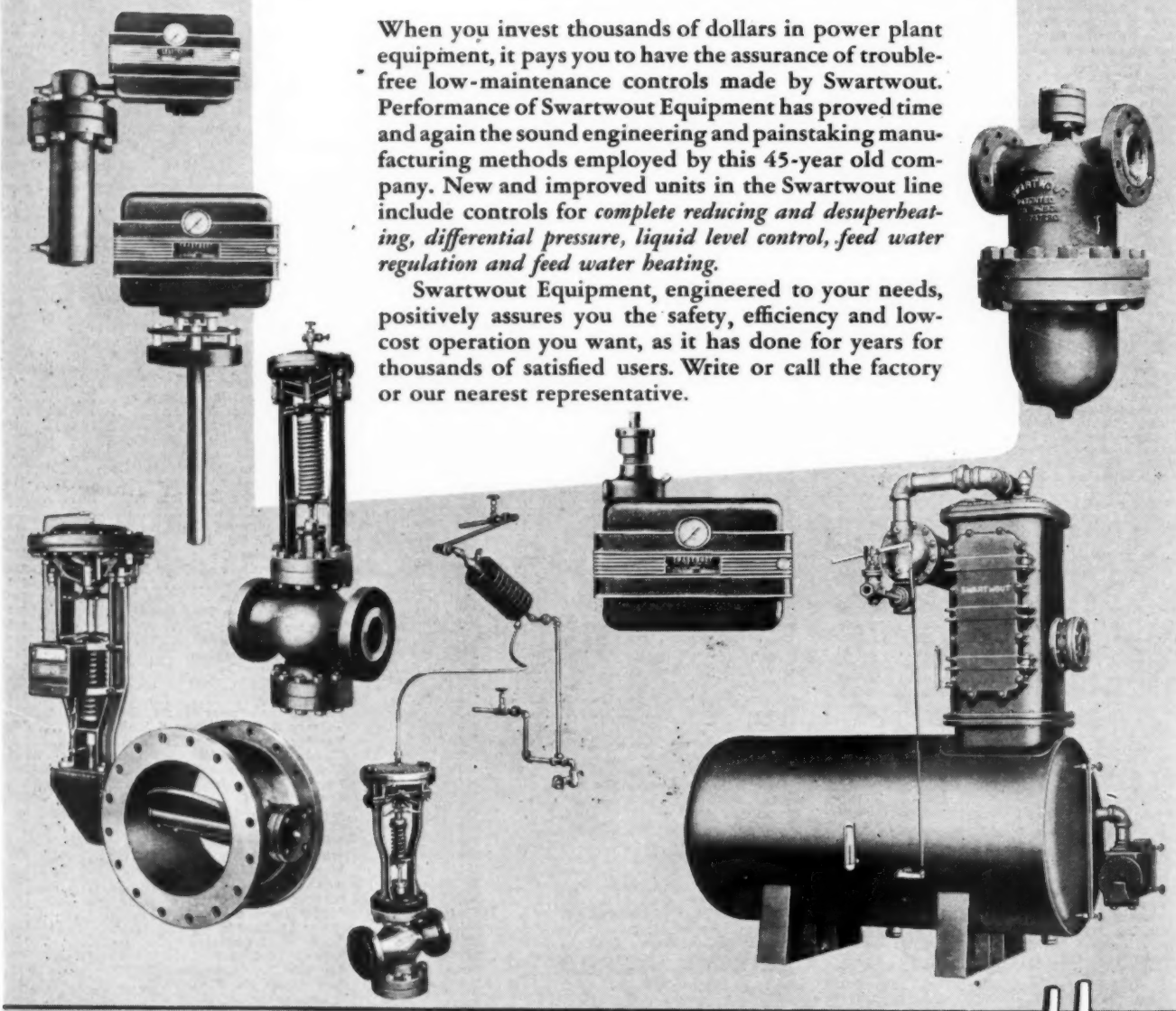

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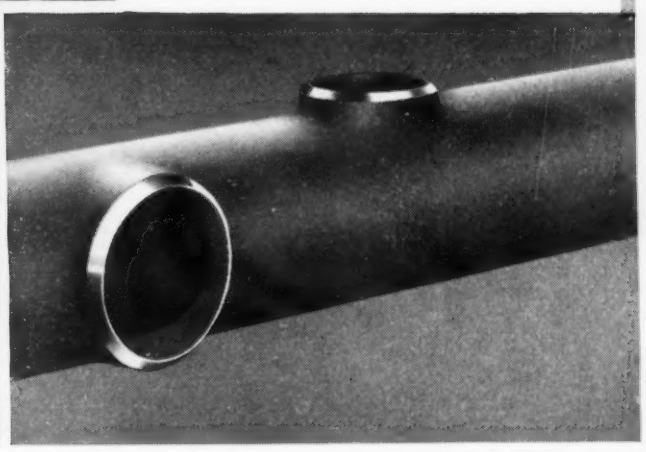

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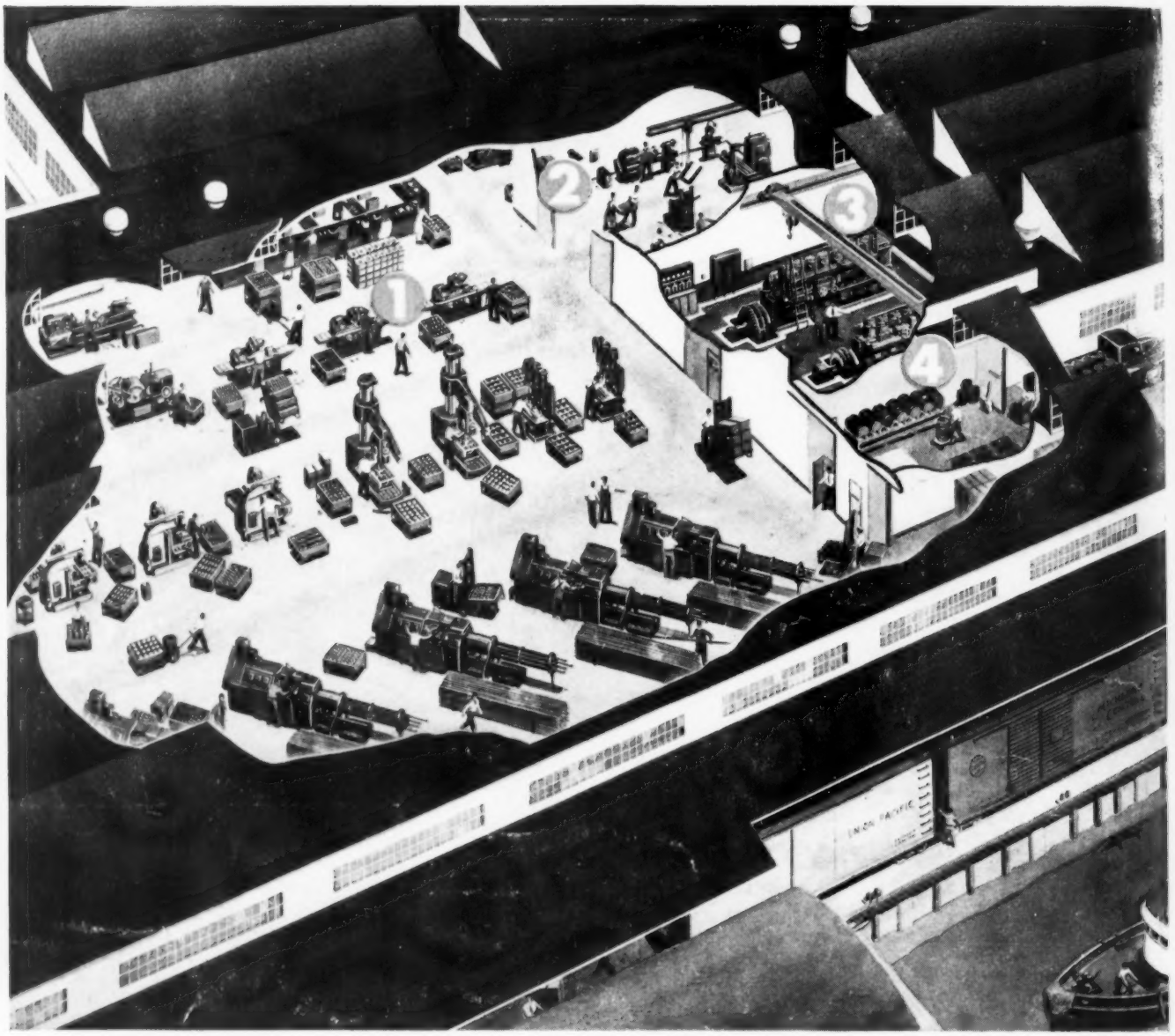

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